



## BLOOD FOR THE BRAVE

Vol-63-No-4 (April-1943)



Fighting men are losing blood! . . . blood which must be replaced by mothers and schoolgirls, merchants and laborers, the office boy and the business executive. Fighting men are getting blood—thousands of units collected by the Red Cross in a united effort for United Nations.

In the Lilly laboratories men and women in fleece-lined clothing work in low-temperature rooms where blood, generously donated, is reduced to plasma, frozen, and dried. Plasma is processed by Eli Lilly and Company, without profit, for exclusive use by the armed forces.

ELI LILLY AND COMPANY • INDIANAPOLIS, INDIANA, U. S. A.



M

B

ULTI-

BETA CAPSULES

MEET EVERY REQUIREMENT

FOR ADEQUATE B COMPLEX THERAPY:

- 1 The full adult basic daily requirements (F.D.A.) of the two definitely proved factors—thiamine hydrochloride 1 mg. and riboflavin (B<sub>2</sub>) 2 mg.
- 2 The full adult basic daily requirement of Nicotinic Acid (10 mg.) recommended by the Food and Nutrition Board of the National Research Council.
- 3 The balanced proportion of these three factors recommended by the Council on Foods and the Council on Pharmacy and Chemistry.
- 4 Addition of substantial amounts (0.25 mg. each) of pyridoxine hydrochloride and calcium pantothenate—two factors which are essential for laboratory animals, and probably for humans.
- 5 All the other known and unknown components of natural vitamin B complex obtained from 167 mg. of high potency brewers' yeast concentrate.
- 6 Economy and convenience—low cost to the patient; one capsule daily is the average protective dose.



WHITE'S  
MULTI-BETA  
(Vitamin B Complex)  
CAPSULES

White's Multi-Beta Liquid provides the known clinically important factors of vitamin B complex for drop-dosage medication.

White's Natural B Complex Tablets—the entire B complex derived from rich, natural sources.

White's PRESCRIPTION vitamins



In response to requests from pediatricians, we are now also marketing PABENA—precooked oatmeal, enriched with vitamin and mineral supplements. PABENA closely resembles Pablum in nutritional qualities, and offers the same features of thorough cooking, convenience and economy. Supplied in 8-ounce cartons. Samples on request.

MEAD JOHNSON & COMPANY, EVANSVILLE, IND., U.S.A.

Promotes "Habit-Time" of Bowel Movement

# Petrogal<sup>a</sup>



\*Petrolatum mineral oil suspended in a flavorless aqueous gel.  
U.S.P. U.S.P. Petrogal is an aqueous suspension  
of pure mineral oil. Each 100 cc. of which contains  
5cc. pure mineral oil suspended in a flavorless aqueous gel.  
Try Petrogal on your next group of patients.

Petrogal adds unsurpassable fluid in the  
colon. Drugs about comfortable elimination.  
Five types offer latitude of choice in treat-  
ing a wide range of conditions.

Petrogal is pleasant to take. It may be  
thinned with water, milk or fruit juices.

Petrogal is suspensioin of mineral oil,  
an aqueous suspension of mineral oil,  
known.

As an aid in establishing "Habit Time"  
Petrogal has long been favorably  
received by the fine division of suspended  
oily globules.

Physicians agree, "Habit Time" is the  
best corrective measure in treating con-

Petrogal Laboratoires, Inc.  
Chicago, Illinois

Supplied in 5 Types



tion with no straining . . . no discomfort.  
Unlike plain mineral oil, Petrogal sup-  
plies moisture . . . retains moisture . . .  
countercacts excessive dehydration.

Petrogal adds unsurpassable fluid in the  
colon. Drugs about comfortable elimination.  
Five types offer latitude of choice in treat-  
ing a wide range of conditions.

An aqueous suspension of mineral oil,  
known.

Physicians agree, "Habit Time" is the  
best corrective measure in treating con-

Proverb

"A man is an animal  
and Petrogal makes it easy to  
eat like a hot-time for bowel movement."

Refractive error is consistently noted and objective evidence of hypermetropia, amblyopia, and myopia is demonstrated. Physical therapy is conducted by means of hydrotherapy with ORETON by mouth and ORETON-M-THIATYL mouth. Stimulated ORETON impulses of 5, 10 and 25 mg. and ORETON-M-THIATYL tablets of 10 mg.

When failing vigor and physical inadequacy result from androgen deficiency in the male climacteric, replacement therapy with ORETON, male sex hor-

## *in middle-aged men*

# ORETON



## ERTRONIZE THE ARTHRITIC

The value of ERTRON in the treatment of chronic arthritis is repeatedly demonstrated in the rapidly growing list of published articles appearing in current literature.<sup>†</sup>

# ERTRON\*

ERTRON, the only high potency, activated, vaporized ergosterol (Whittier Process), is made only in the distinctive two-color gelatin capsule.

*ERTRON is promoted only through the medical profession*

<sup>†</sup>Complete bibliography and dosage card available upon request.

\*Reg. U. S. Pat. Off.

NUTRITION RESEARCH LABORATORIES  
CHICAGO



## Is there any help for an overworked doctor?

YES—BIOLAC, because it saves you valuable time. It's a complete infant formula and there are no extra ingredients to calculate.

Biolac provides completely for all nutritional needs of the young infant except vitamin C.

Prescribe Biolac routinely to reduce the possibility of errors and contamination in formula preparation. It requires only simple dilution with boiled water . . . as you prescribe.

## NO LACK IN **BIOLAC**

Borden's complete infant formula

• *Biolac is prepared from whole milk, skim milk, lactose, Vitamin B<sub>1</sub>, concentrate of Vitamins A and D from cod liver oil, and ferric citrate. It is evapo-*

*rated, homogenized, and sterilized. For professional information, write Borden's Prescription Products Division, 350 Madison Avenue, New York City.*



# CHAMPION

## *Moisture and Serum Proof* **SILK SUTURES**

Braided and impregnated with non-irritating materials, CHAMPION Silk Sutures offer surgeons *the perfect suture medium.*

- \* **SAFE:** Free from absorption of germs, reducing the possibility of infection. Maintain strength. Fine diameters with greater strength permit the use of smaller sizes, resulting in lessened trauma and fewer post-operative disruptions.
- \* **EASY TO USE:** CHAMPION sutures offer better handling qualities: even strength, slight stiffness, non-adherent to gloves. Knots tie more easily and hold well. No adherence to skin or tissue, making withdrawal painless. Withstand repeated sterilization.
- \* *Free operating lengths furnished on request—kindly state sizes desired.*



### **GUDEBROD BROTHERS SILK CO., INC.**

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LOS ANGELES

#### MAKERS OF

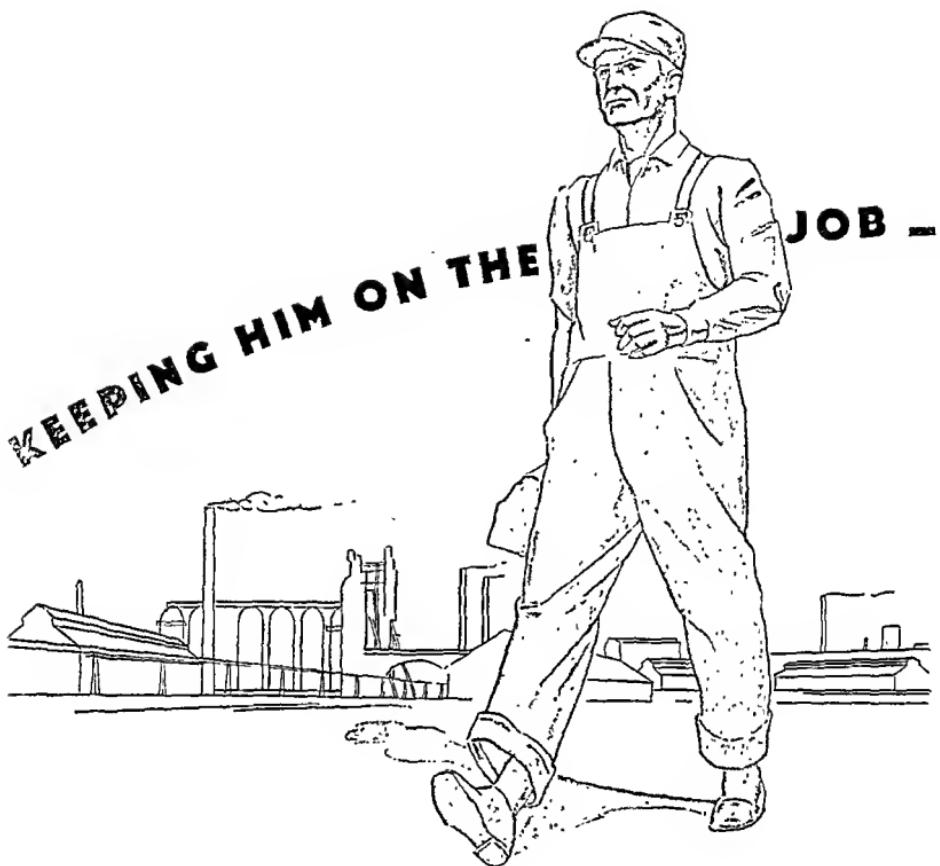
\* Champion Serum Proof Sutures

\* Champion Dermal

\* Gudebrod's Nylon Sutures

\* NON-ABSORBABLE SUTURES BY GUDEBROD

\* Pare Serum Proof Silk



Hemorrhoids rank comparatively high among the causes of lost "man hours." Today, more than ever, this should be a matter of concern to physicians.

Whenever non-surgical treatment is indicated, Anusol may be used with the knowledge that it will afford the kind of relief likely to keep the patient on his job. By their emollient properties Anusol

Suppositories reduce inflammation, alleviate pain and check the bleeding. They contain no narcotic or anesthetic to give the patient a false sense of security.

We suggest that you give Anusol a trial in one of your ambulant cases; we shall be glad to send you a supply for that purpose.

SCHERING & GLATZ, INC.  
113 West 18th Street, New York City

**ANUSOL HEMORRHOIDAL SUPPOSITORIES**

# ANOTHER HANDICAP *overcome*

Riboflavin (vitamin B<sub>2</sub>) is now available in highly soluble form . . . This makes it possible to inject riboflavin in the larger dosage indicated in frank deficiency without causing a local or systemic reaction . . . Moreover, any parenteral route may be selected — subcutaneous, intramuscular, intravenous.

Flavaxin Soluble "Niphanoïd" is employed for the specific treatment of all types of ariboflavinosis.

Supplied in ampuls of 5 mg. in boxes of 5 and 25.

## FLAVAXIN\* SOLUBLE *Niphanoïd* \*\*

Flavaxin, Brand of Synthetic Riboflavin



This cherished  
symbol of distinguished  
service to our Country waves  
from the Winthrop flagstaff.

WINTHROP CHEMICAL COMPANY, INC.

*Pharmaceuticals of merit for the physician*

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WINDSOR, ONT.

\*Flavaxin, trademark Reg. U. S. Pat. Off. & Canada

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# *Tranquillity*

## OF THE G. I. TRACT



**T**RASENTINE-PHENOBARBITAL is an effective relaxant for central nervous tension and smooth muscle spasm. It was designed to produce relative tranquillity of the G. I. tract.

TRASENTINE-PHENOBARBITAL combines the well-known qualities of atropine and papaverine with the time-tested effectiveness of phenobarbital.

Additional benefits occur in that dryness of mouth, palpitation, Mydriasis and Cycloplegia are not found as with atropine administration.

### **TRASENTINE-** **PHENOBARBITAL**

AN EFFECTIVE AUTONOMIC AND CENTRAL NERVOUS SYSTEM SEDATIVE

•  
TRASENTINE-PHENOBARBITAL IN BOXES  
OF 40 AND 100; BOTTLES OF 500

\*Trade Mark Reg. U. S. Pat. Of



# C I B A

Pharmaceutical Products, Inc.  
SUMMIT, NEW JERSEY



# THE SYNDROME OF LOWNESS

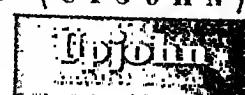
**LOW MUSCLE TONE, LOW BLOOD PRESSURE  
LOW RESISTANCE** are part of a syndrome characteristic  
of adrenal cortical insufficiency.

Adrenal Cortex Extract (Upjohn) is a most potent specific therapy now available for alleviation of these typical symptoms, when due to adrenal cortex insufficiency. Adrenal Cortex Extract (Upjohn) is a potent natural complex representing steroids which influence carbohydrate metabolism, capillary tone, vascular permeability, plasma volume, body fluids and electrolytes. "No one of these substances and no synthetic substance has yet been shown to possess all of the effects of a potent cortical extract." N. N. R. 1942

## ADRENAL CORTEX EXTRACT (UPJOHN)

Sterile Solution in 10 cc. rubber-capped vials for sub-cutaneous, intramuscular and intravenous therapy.

Another way to save lives  
BUY WAR BONDS  
FOR VICTORY



# BEZON PRICES REDUCED!

## Whole Natural Vitamin B Complex at New Low Price to the Patient

There has been a constantly increasing prescription demand for BEZON because it presents the Whole Natural Vitamin B Complex in concentrated, easily administered form.

This increased clinical use of BEZON is reflected in reduced manufacturing costs, which we pass on to your patients in the form of a substantial price reduction.

### The New Low Prices on BEZON are:

Bottles of 30 capsules . . . . .	\$2.00
Bottles of 100 capsules . . . . .	\$5.00

## BEZON\*

### WHOLE NATURAL VITAMIN B COMPLEX



\*Trade Mark

—concentrated to high potency from natural sources—no synthetic factors are added. Only in the Whole Natural Vitamin B Complex can all 16 vitamin B factors be obtained.

Supplied in bottles of 30 and 100 capsules.

BEZON is made only in the distinctive two-color gelatin capsule.

Samples and literature available on request.

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CHICAGO

# AN AID to rapid healing



## COL-VI-NOL



Not Advertised to the Laity

### COL-VI-NOL (ULMER)

Ulmer Pharmacal Company again leads the field in presenting to the medical profession a cod liver oil ointment, COL-VI-NOL (Ulmer), each ounce of which contains the equivalent in vitamins of 1½ ounces of U.S.P. cod liver oil. Extensive clinical data indicates the usefulness of COL-VI-NOL (Ulmer) in treating burns, cuts, abrasions, denudations, indolent wounds and on all kinds of surgical dressings. It is pleasant to use, being completely free of any disagreeable fishy cod liver oil odor and its consistency minimizes dissipation into dressings. Research shows that it is of particular value in the process of healing wounds since—

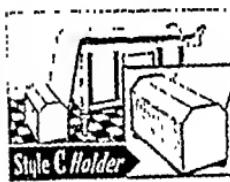
COL-VI-NOL (Ulmer) has proven to be very efficacious in the treatment of sore and cracked nipples. It is pleasant to use and easily removed before nursing. A trial will readily prove its superiority. Include a trial jar with your next order.

COL-VI-NOL (Ulmer) - \$2.50 per pound

Distributed by

**PHYSICIANS AND HOSPITALS SUPPLY CO., Inc.**  
MINNEAPOLIS MINNESOTA

# SOLAREUM PAPER TABLE SHEETING



SOLAREUM Sheeting is purposely made for efficient service in the modern physician's office. It is clean, white, strong and durable. It is conveniently, quickly spread over your table, and is pleasant to lie on. There is no crackling noise, no cold feeling, no discomfort to disturb the nervous patient.

SOLAREUM Sheeting is inexpensive, saving nearly all or much of the laundry cost, according to the nature of your practice. It gives you a clean sheet for each patient at minimum cost. Distributed over an entire year this saving is well worth considering.

Modern patients are contagion-conscious, and so are impressed by this touch of efficiency. They appreciate your consideration of their welfare when they see you draw the immaculate sheet of SOLAREUM on the table to prevent contagion.

## SPECIAL OFFER

As a special introductory offer during April we are offering either a Style A or a Style B holder FREE with an order for three or more rolls of SOLAREUM Sheeting. Specify width of sheeting and style holder wanted when ordering. 18 inch \$3.00 per roll. 20 inch \$3.25 per roll.



**PHYSICIANS AND HOSPITALS SUPPLY CO., Inc.**  
414 SOUTH SIXTH ST., MINNEAPOLIS, MINN.

Anemia and  
The Ides of March

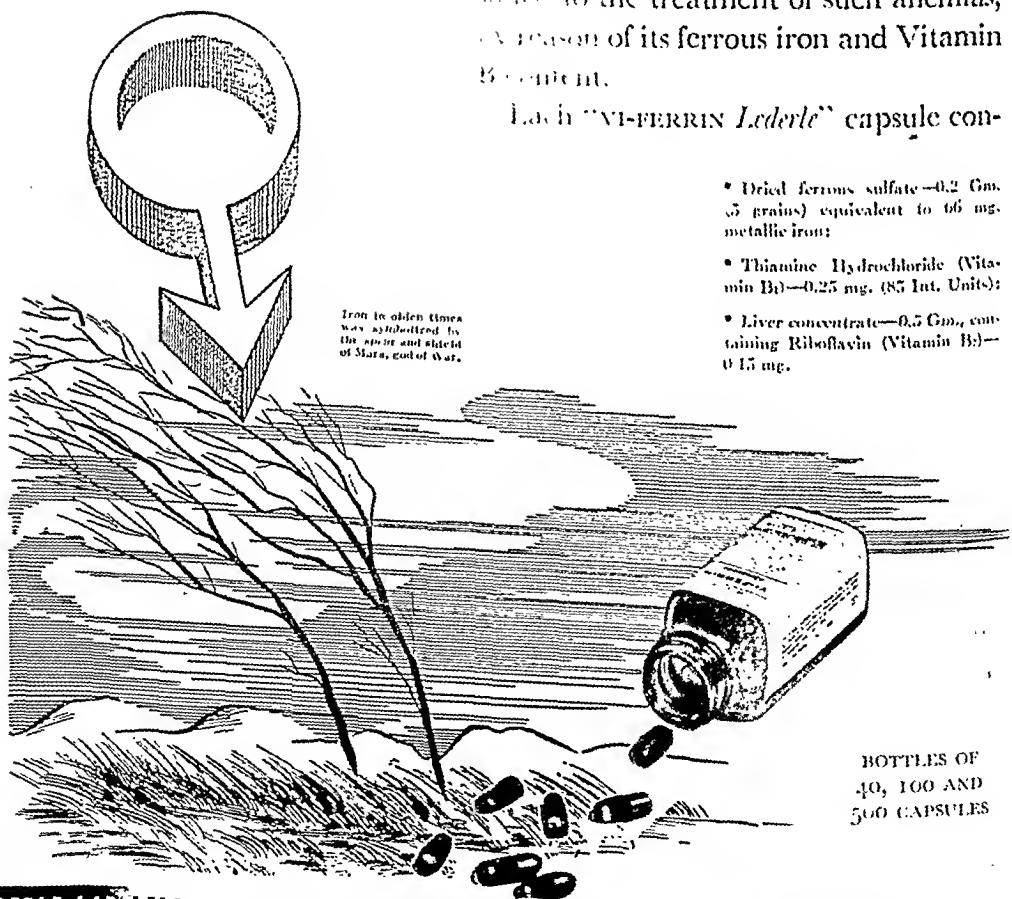
# VI-FERRIN

## *Lederle*

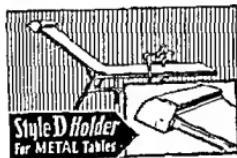
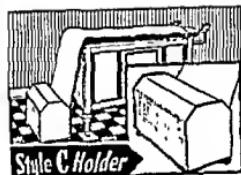
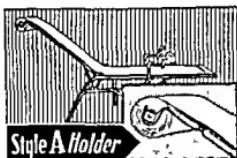
SECONDARY ANEMIA follows closely the many respiratory and other infections so prevalent in early spring. Once a course of the infection has been completed, treatment of the secondary anemia so frequently present should be initiated. This treatment should be directed not only toward hemoglobin concentration, but also toward remedy of dietary anorexia.

"VI-FERRIN Lederle" is particularly suited to the treatment of such anemias, because of its ferrous iron and Vitamin B<sub>1</sub> content.

Each "VI-FERRIN Lederle" capsule con-



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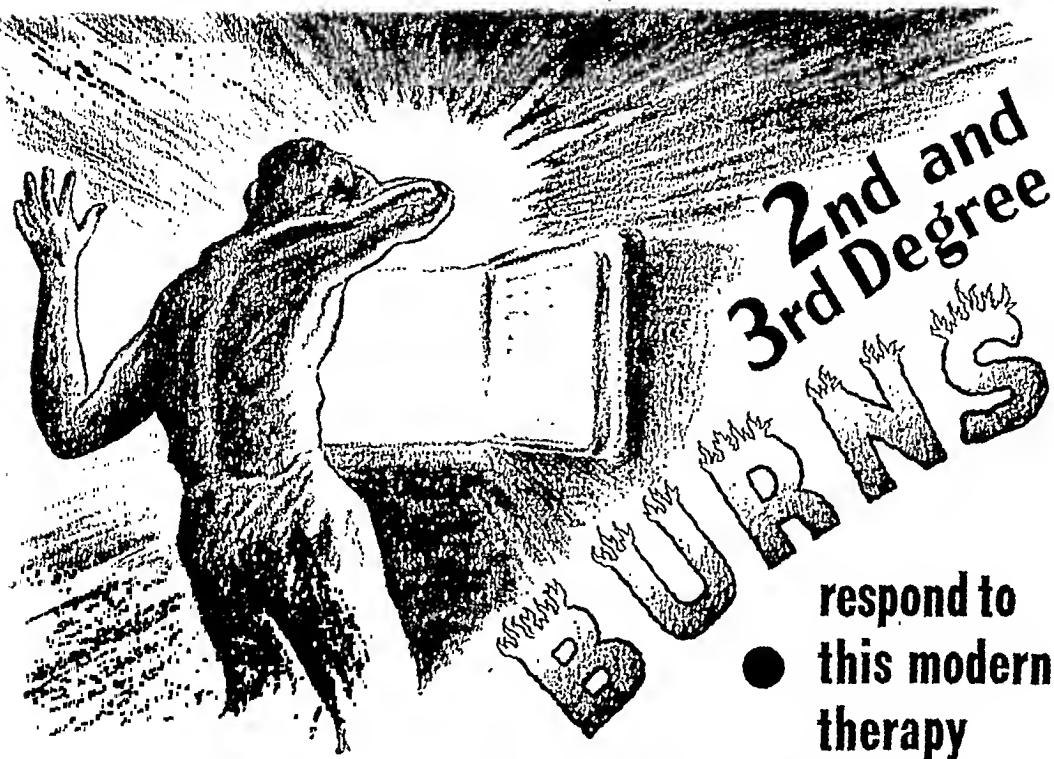
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**2nd and  
3rd Degree  
BURNS**

● respond to  
this modern  
therapy

*Also Indicated for*

- BURSITIS • DIABETIC ULCERATIONS • DEEP NECROTIZING ULCERS • CIRCULATORY ULCERATIONS • OSTEOMYELITIS
- INFECTED WOUNDS • COMPOUND FRACTURES • DECUBITUS ULCERS • LUETIC ULCERS

*Available in Two Forms*

**POWDER.** This white crystalline powder is packed in  $\frac{1}{4}$  ounce and 1 ounce vials, and 1 pound bottles, ready for dusting. Solution can be made in distilled water or physiological saline solution for wet dressings. Generally used in strength between 0.5 to 0.8%.

**2% OINTMENT** in a soothing Special Absorption base is rapidly and completely absorbed. Does not leave a dry, cracked surface or cause bandages to adhere. Will absorb considerably in excess of its own weight in water. 1 ounce, 2 ounce and  $\frac{1}{4}$  ounce jars.

*Send for Literature and  
Professional Sample*

### *Therapeutic Advantages:*

1. Activity not hindered . . . Allantoin constituent acts as chemical debrider which removes Sulfonamide inhibitors enabling the Sulfanilamide part of the radical to exert its full action in preventing and controlling infection.
2. Stubborn Cases . . . Whether acute or chronic, cases have cleared up when other forms of treatment have failed.
3. Soothing . . . To the most sensitive tissue.
4. Easy to Apply . . . Dressings removed without discomfort.
5. Healing . . . Rapid and uneventful in less time than under normal treatment.
6. No skin maceration . . . Skin tone actually improves.
7. No local or systemic reactions have been observed.
8. Economical . . . Very little required . . . powder or ointment.

# **SULFALLANTOIN**

A Loose Addition Product of Sulphanilamide and Allantoin (P-Amino Benzene Sulphonamide Glyoxylidureide) Pat Pending

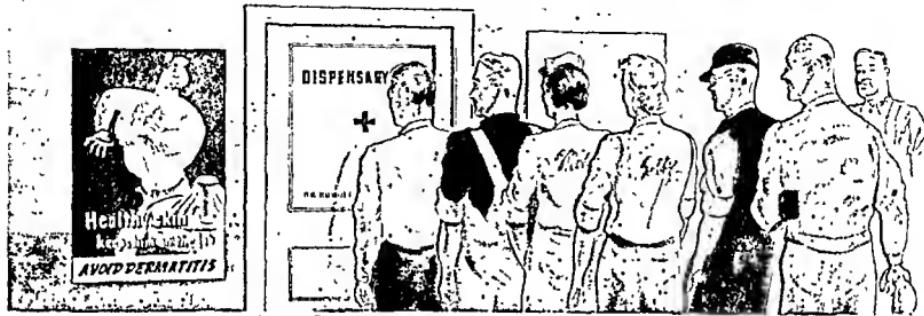
**SCHUYLKILL CHEMICAL CO. •**

2346-J SEDGLEY AVENUE, PHILADELPHIA, PA.

# *Just a minute, Doctor...*

## **TARBONIS CREAM**

*can help you fight DERMATITIS and keep  
your men and women on the job . . .*



ON FARM or IN FACTORY every minute counts. Sabotage of manpower by dermatitis, whether it be on workers in the plants, on the farms, or a case of infantile eczema that keeps a worried mother off the job, can be stopped with the help of Tarbonis Cream.

The Tarbonis Cream formula was developed in the Pharmacy of Johns Hopkins Hospital and has been successfully used there for eight years on innumerable cases of eczema, infantile eczema, seborrheic dermatitis and eczematoid dermatitis.

**Positive Results in 24 to 72 Hours**  
Tarbonis Cream is not a "chemical glove" subject to abrasion by grime and grit. Tarbonis Cream alleviates the itching and does not clog the pores. It is a greaseless, healing protector that

will not irritate the most sensitive skin. Many physicians report cases in which Tarbonis Cream has achieved definite results in 24 to 72 hours.

*You can see for yourself what Tarbonis actually accomplishes. For your convenience, mail in the coupon below.*

*We have Tarbonis in stock for immediate delivery.*

C. F. ANDERSON COMPANY, INC.  
901 Marquette Avenue  
Minneapolis, Minn.

Gentlemen: I am interested in Tarbonis Cream. Please send me more information.

Name .....

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*Manufactured by Donald Merrell & Company for  
THE TARBONIS COMPANY, Cleveland, Ohio*

**C. F. ANDERSON CO., INC.**

**901 Marquette Avenue • Minneapolis, Minnesota**

send the  
cigarette that's the

## FAVORITE OF THE ARMED FORCES \*

**F**RRIEND or relative—send him cigarettes—the first choice among officers and in the ranks—the gift they prefer above all others. The brand? Camels—by actual survey\*, first choice of American men in war.

Slow-burning Camels have the features that service smokers want—extra mildness, smooth mellow-ness, better flavor—every puff.

Your dealer will gladly serve you with Camel cigarettes by the car-ton; see him today.

# Camel

costlier tobaccos

REMEMBER, you can *still* send Camels to Army personnel in the U. S., and to men in the Navy, Marines, or Coast Guard wherever they are. The Post Office rule against mailing packages applies only to those sent to the overseas Army.

\* With men in the Army, the Navy, the Marine Corps, and the Coast Guard, the favorite cigarette is Camel. (Based on actual sales records in Post Exchanges and Canteens.)



# PASADYNE

stands first on the list of palliatives useful  
in combating nervous disturb-  
ances of the menopause.

POTENT  
SAFE  
NON-HABITUATING

JOHN B. DANIEL, Inc.

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PIONEER  
QUIXAM



EITHER  
HAND GLOVE

## YOU CAN CONSERVE RUBBER

One glove, not a pair—fits either hand. Short wrist, quick easy on and off for examinations, dressings, treatments. No broken pairs, sorting or turning. You buy one instead of a pair at less than half the cost; only 3 sizes needed. Made of finest sheer latex.

BROWN & DAY, INC.  
SAINT PAUL, MINNESOTA

Anemia and  
The Ides of March

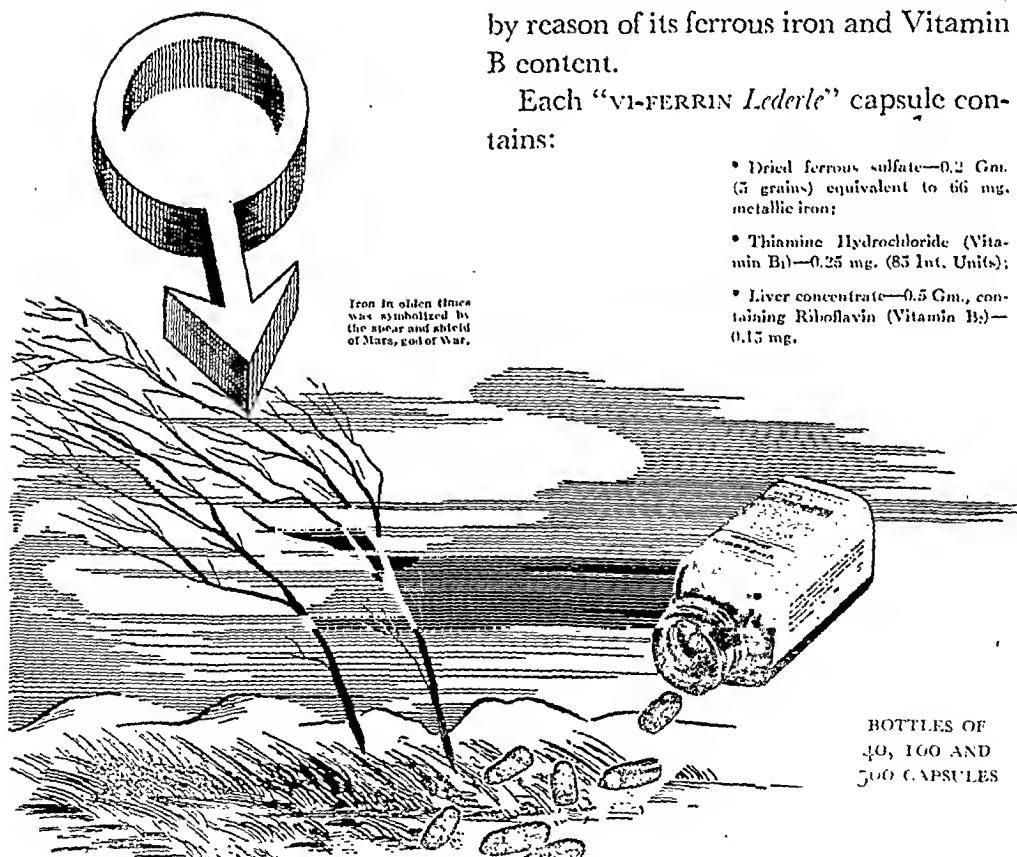
VI-FERRIN  
*Lederle*

SECONDARY ANEMIA follows closely the many respiratory and other infections so prevalent in early spring. Once the course of the infection has been arrested, treatment of the secondary anemia so frequently present should be commenced. This treatment should be directed not only toward hemoglobin regeneration, but also toward remedy of the dietary anorexia.

"VI-FERRIN *Lederle*" is particularly suited to the treatment of such anemias, by reason of its ferrous iron and Vitamin B content.

Each "VI-FERRIN *Lederle*" capsule contains:

- Dried ferrous sulfate—0.2 Gm. (5 grains) equivalent to 66 mg. metallic iron;
- Thiamine Hydrochloride (Vitamin B<sub>1</sub>)—0.25 mg. (85 Int. Units);
- Liver concentrate—0.5 Gm., containing Riboflavin (Vitamin B<sub>2</sub>)—0.15 mg.



BOTTLES OF  
40, 100 AND  
500 CAPSULES



# The JOURNAL LANCET

Minneapolis, Minnesota  
April, 1943

Vol. LXIII, No. 4  
New Series

## Tuberculosis--Post-War

Kendall Emerson, M.D.†  
New York City, New York

Carlyle wrote, "No little hope sufficeth—in the face of universal destruction." Tuberculosis fighters in the invaded lands of Asia and Europe are facing the universal destruction of their life work at the ruthless hand of half-civilized conquerors. It demands no little faith, no meagre courage, to carry on. Yet reports of their undaunted heroism are drifting in.

From an old friend in Belgium comes a piteous cry for a few vitamins to eke out the starvation ration allowed him for his patients. Dr. Lim and his devoted colleagues are promoting more than a semblance of public health work in China in addition to the overwhelming demands made on their time and strength by emergency war duties. Despite their efforts the white plague rides again in these and all other occupied countries.

Must we too expect a recrudescence of our ancient enemy? The war has rendered us short-handed in doctors and nurses to care for the sick and in public health personnel to maintain established preventive measures. Extra burdens fall on those of us destined to fight the war along the home front. It is for us who remain to take up the guage of battle, to assume double duty, to join forces in guarding the public safety.

The Early Diagnosis Campaign this year is an appeal to the loyalty and patriotism of all practising physicians to contribute their full strength and interest toward fighting the spread in this country of those communicable diseases which add a further disaster to the grim tragedy of war. We are especially grateful to the JOURNAL-LANCET for continuing its fine record of public service by emphasizing this national danger and by pointing out our professional responsibility to combat any decline in our standards of tuberculosis control.

†Managing Director, National Tuberculosis Association

Anemia and  
The Ides of March

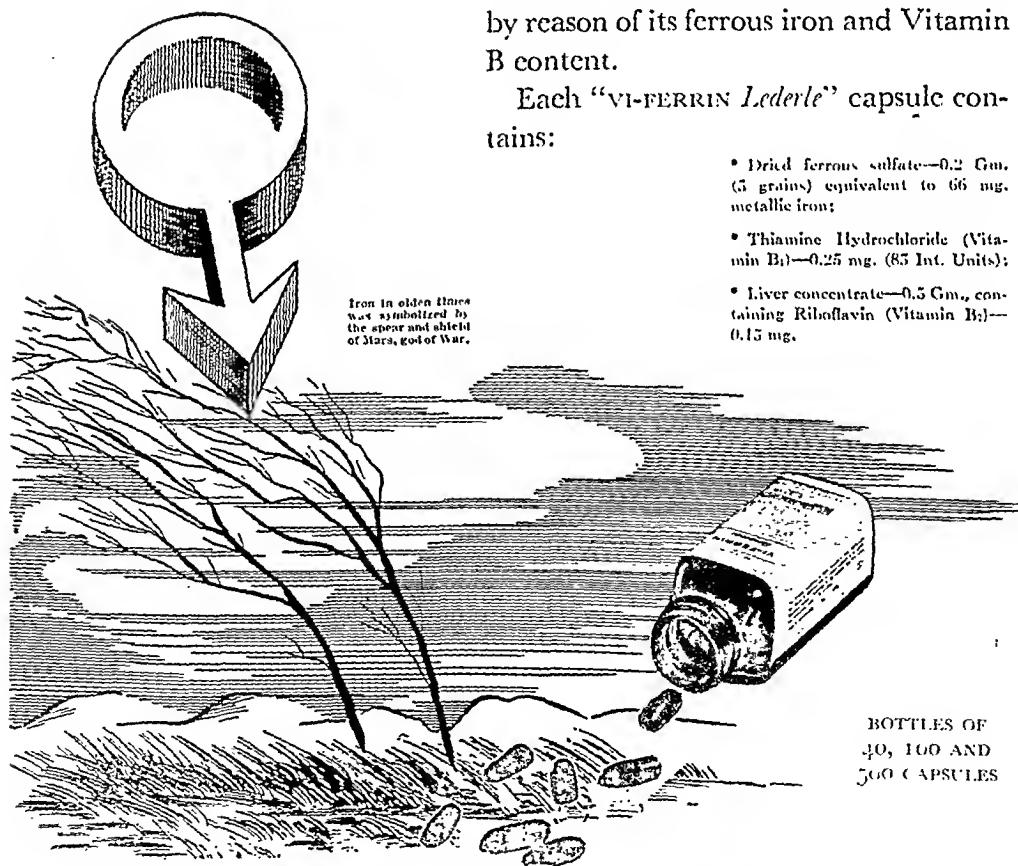
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BOTTLES OF  
40, 100 AND  
500 CAPSULES

clinical disease. On the other hand, it appeared clear from their results that increasing dosage soon brings the test into the range of nonspecificity, where persons presumably free from present or past contact with tuberculosis react. Their results indicated that 0.0001 mg. of purified protein derivative represents approximately the critical level, lesser doses being highly specific and higher doses causing an increasing percentage of nonspecific reactions. Studies at the Henry Phipps Institute have repeatedly demonstrated the effectiveness of the standard first dose of the purified protein derivative in eliciting a positive tuberculin reaction in cases of clinical tuberculosis."

In our experience in the State of Washington there has been a slow, but very definite, decline in the percentage of positive reactors during the past ten years. The results among high school students are as follows:

	No. of Tests	Positive	Per Cent Positive
Sept. 1931—April 1935	17,191	2,356	13.70
May 1935—May 1938	15,929	1,890	11.86
June 1938—May 1941	17,309	1,759	10.04
Total	50,629	6,005	11.85

It will be noted that the drop in percentage of positive reactors for the two three-year periods was almost identical—1.84 per cent from 1935 to 1938 and 1.82 per cent during the three years 1938-41.

During the same ten-year period the following results were noted among younger pupils (junior high and grade school pupils):

	No. of Tests	Positive	Per Cent Positive
Sept. 1931—April 1935	8,026	867	10.80
May 1935—May 1938	13,156	1,065	8.09
June 1938—May 1941	15,967	889	5.56
Total	37,149	2,821	7.59

No city children are included in the 87,778 pupils shown in the preceding tabulations. Testing in the cities of Seattle, Tacoma, and Spokane has been done by the tuberculosis organizations and local health authorities in those cities.

Comparison of the four different age groups—grade and junior high school pupils, senior high school students, college students, and finally an adult group (teachers) shows very definitely an increase in positive reactors as the age of the group advances. Of the 4,497 college students tested, a total of 874, or 19.43 per cent, were positive. Teachers showed a percentage almost twice that of the college students—37.65 per cent positive (1,470 positive reactors out of 3,904 teachers given the tuberculin test).

As do similar organizations in other states, the Washington Tuberculosis Association carries on a general educational program not only in the public schools and colleges but also among the general population of the

state. For the past two years a large part of the chest clinic work in Washington has been conducted by the state department of health, particularly in those counties in which there is a full-time county health unit. The county tuberculosis organizations cooperate in the clinic program, and in many instances where the family in question is unable to pay for x-ray service they pay for chest films requested by the clinician. These chest clinics afford opportunity for re-examination of many of the ten thousand or more positive reactors that have been found in our tuberculin testing program during the past ten years.

As a result of the program of health education in the high schools, the tuberculin testing procedure itself and the follow-up after the tests, a very definite amount of active tuberculosis should actually be prevented, and a considerable number of deaths from tuberculosis in later life avoided. If a total of 500 cases of clinical tuberculosis can be prevented by the testing and education of 100,000 individuals, the number tested in the State of Washington, the saving in actual money alone would eventually be more than \$1,000,000. This is at the very low estimate of \$2,000 per case—\$1,000 for sanatorium care and \$1,000 for loss of earning capacity during the period of illness and treatment. If the educational and preventive work were not done, and these 500 cases went on to develop moderately or far advanced tuberculosis, the mortality would reach at least 100, many of the deaths among young people.

The campaign against tuberculosis calls for sustained and varied effort along many different lines. Procedures that help find the open cases of tuberculosis, and get these patients isolated and under scientific care and treatment, should of course be increasingly utilized. In the long view, however, education of the general population concerning this age-old disease would seem to be one of our best methods of approach to the problem. The very encouraging fact that tuberculosis really is preventable, and also curable when found early, should direct our plans and energies more and more toward finding the cases earlier, or better still, discovering the potential cases by widespread use of the tuberculin test and greater employment of all available x-ray facilities.

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#### DO SOMETHING FOR A SERVICE DOCTOR

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# The Tuberculin Test in Tuberculosis Control

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**A**N examination of the chest by x-ray only may be satisfactory if the purpose of the examination is merely to determine the presence or absence of pulmonary pathology at the time of the examination. But I think it is a serious mistake to eliminate the tuberculin test as part of an examination if the purpose of that examination is to control tuberculosis. I hold to this belief even where it is less costly to x-ray the entire group than to first administer the tuberculin test to the entire group, then x-ray the reactors.

In December, 1937, a program to control tuberculosis was started in De Kalb County, Illinois, and in September, 1938, a similar program was started in La Salle County. The program is the practical application of the principles of tuberculosis control advocated for the past fifteen years by several specialists in the field.

Previous to the introduction of this program, minimal tuberculosis in these two counties had not been recognized. During 1941, 53 per cent of all the new cases of pulmonary tuberculosis discovered in De Kalb County were found while still in the minimal stage; 43 per cent of those in La Salle County were minimal cases.

In 1937, Da Kalb County had 15 deaths from pulmonary tuberculosis, or a tuberculosis death rate of about 45 per 100,000. In 1938 La Salle County had 48 deaths from pulmonary tuberculosis, or a tuberculosis death rate of 48 per 100,000. These figures vary but little from the tuberculosis death rate of the state for the same period.

There were 3 deaths from pulmonary tuberculosis in Da Kalb County in 1940, a rate of 9 per 100,000; 2 deaths in 1941, a rate of 6 per 100,000. To November, 1942, we have had 3 deaths; two of these cases were first diagnosed as pulmonary tuberculosis before 1937.

La Salle County had a death rate of 18 per 100,000 in 1940, 25 per 100,000 in 1941; to November, 1942, there have been 6 deaths from pulmonary tuberculosis and one from tuberculous meningitis. One of the six patients who died had been in the county only six weeks before death, having spent the previous four years at a state hospital.

Our success during the past few years in reducing the death rate from pulmonary tuberculosis in these two counties can be attributed in a large measure to the use of the tuberculin test.

Unity of medical thought concerning tuberculosis is important in a tuberculosis control program. The medical profession in these two counties represented not only the tuberculosis teaching of different medical schools, but the ever-changing tuberculosis teaching at the same medical school during the evolution of our present-day concepts of this disease.

The tuberculin-testing surveys were used primarily for their educational value. Doctors were hired in rotation

\*LaSalle County Sanatorium.

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to conduct the testing clinics in the high schools of the county. From this experience these physicians learned the technic of tuberculin testing and became familiar with the various reactions to tuberculin. Not merely did they discover that only about 20 per cent of these young adults reacted to tuberculin, but also that among the reactors were a large number who had no known history of contact to tuberculosis.

These facts plus the recently acquired familiarity with the tuberculin test induced the doctors to give tuberculin tests to their private patients. It was not long before they discovered active pulmonary tuberculosis in patients who had never been suspected of having the disease, from either the history, the symptoms, or the physical examination. The lesions, however, could be definitely demonstrated on the x-ray film, and some of the patients even had advanced tuberculosis. The doctors soon recognized the importance of an x-ray examination of the chest for diagnosing pulmonary pathology, particularly early tuberculosis. Most of the doctors thus became convinced of the importance of the tuberculin test in discovering reactors and of the importance of x-raying all reactors for possible active tuberculosis.

A few of the doctors, as is true in any community, held to the ideas about tuberculosis that they had been taught in medical school and did not readily accept the tuberculin test as a method for discovering tuberculous infection; nor did they accept the idea that patients could have active tuberculosis yet appear healthy and have physical findings that they could not detect.

This small group learned the hard way—by experience. I shall present a few cases relating these experiences.

## CASE REPORTS

**Case 1.** F. S., a girl aged 20, worked daily in a factory and attended about three dances a week. She had been under the care of her family physician for about three months, became dissatisfied and changed doctors. The second physician placed her in a hospital for observation. His examination included the tuberculin test, which showed her to be a reactor. The subsequent x-ray film revealed evidence of extensive disease, which proved to be far-advanced tuberculosis and which required two and one-half years of sanatorium care. The patient had a positive sputum. She is now working and living a normal life—a patient of the second doctor.

**Case 2.** A. R., a man aged 72, had been seeing his family physician for two years because of a cardiac lesion. He finally changed doctors on advice of friends. The second physician included the tuberculin test in his first examination, and the patient was found to be a reactor. Examination including x-ray inspection of his chest revealed advanced tuberculosis. His sputum was positive. The doctor then gave tuberculin tests to the patients' children and grandchildren, all of whom reacted. Although none was found to have clinical tuberculosis, these several families are being examined regularly by the second doctor.

**Case 3.** L. P., a girl aged 20, under the care of her family physician for six months, became dissatisfied and so changed doctors. The second physician included the tuberculin test in his first examination and, finding her to be a reactor, x-rayed

her chest. Far-advanced pulmonary tuberculosis with a positive sputum was diagnosed. This patient died two years later. Her family was also given the tuberculin test; all of them reacted. Further examination, including x-rays of their chests, revealed that two of her sisters had active tuberculosis. The husband of this patient refused to change doctors and later died from tuberculosis. It is believed that he was the original source of infection in this family. The bitterness of the family toward the first doctor can be excused.

*Case 4.* D. J., a woman, aged 26, married, and with one child, called her family doctor because of fever, cough, generalized aching, and other symptoms. The doctor diagnosed influenza, which was prevalent at the time. There being no improvement, three weeks later her mother called another physician. The second doctor included the tuberculin test as part of his first examination. The woman reacted to tuberculin, and other phases of the examination revealed advanced tuberculosis. Her sputum was positive. After 18 months at the sanatorium, she is now home and caring for her family.

*Case 5.* P. G., aged 20, married, worked as a waitress. She is 5 feet, 5 inches tall and weighed 185 pounds. She complained of tiredness, pain in the lower back, and frequency of urination. Her family physician treated her for nine months for a kidney condition. A friend advised that she try another doctor; this second physician included the tuberculin test as part of his examination. She reacted and was found to have far-advanced pulmonary tuberculosis. She had a positive sputum. She has been in the sanatorium for the past 14 months, and it will be some time before she can go back to normal living.

*Case 6.* L. R., a man aged 21, was being treated for chronic bronchitis. A year-old baby in the home at which this patient was a frequent visitor died from a tuberculous meningitis. He worked in a food locker and was requested to have a tuberculin test and, if found to be a reactor, to have an x-ray of his chest. His doctor did not think this was necessary for chronic bronchitis, since his only symptom was a cough which he had had for two years. He lost the job at the food locker and entered a barber college in Peoria. The Peoria health authorities were notified and insisted on a chest examination; this showed advanced tuberculosis with positive sputum. He entered the La Salle County Sanatorium, where he is at the present time. I have presented this case because it has a direct bearing on the next case.

*Case 7.* E. F., a woman aged 28, complained of mental symptoms and sinus trouble. She had visited some twelve doctors in and about Illinois during a six-month period, with no results. She then visited a doctor who gave her a tuberculin test as a routine measure. She was found to be a reactor, and a subsequent x-ray film of the chest revealed chronic tuberculosis. Her sputum contained tubercle bacilli. A thoracoplasty was done. She is now physically well and her mental condition has cleared. The doctor who discovered her true illness is the same doctor who did not think it necessary to give the previous cases a tuberculin test. He has benefited from that experience.

*Case 8.* L. S. The wife of the patient under discussion worked temporarily in the health department, where she came in contact with the tuberculosis program. Upon learning that we advocate routine tuberculin testing of all adults, she and two nephews who live with her were tested and found to be reactors. X-ray films of all three showed no evidence of active tuberculosis. Her husband had never had the tuberculin test, but had been examined frequently during the past ten years for a chronic cough. Sputum examinations on two or three occasions were reported as containing no tubercle bacilli and a diagnosis of chronic bronchitis had been made. The patient weighed 190 pounds and had never lost any time from work. His wife nevertheless urged him to have a tuberculin test. He was found to be a reactor. The x-ray film revealed evidence of a large cavity in the right apex. The sputum contained 50 tubercle bacilli per field. He is in the sanatorium at present waiting for thoracoplasty.

Each of the doctors who missed the diagnosis of pulmonary tuberculosis in the above cases, and thus lost their families as patients, is now giving the tuberculin

test to most of his patients and is an ardent supporter of the tuberculosis program.

These cases illustrate the type of experiences that will be encountered by those doctors who are reluctant to accept the tuberculin-testing program. They also illustrate how the tuberculin test can be used to ferret out cases of pulmonary tuberculosis. In a community where the tuberculin test is widely used all the doctors will ultimately use it as a diagnostic aid, if for no other reason than self-protection.

It has been of interest to note from our experience how many family doctors became interested in tuberculosis only after taking an active part in a tuberculin-testing survey. Such surveys in the schools make the doctors tuberculosis-conscious; tuberculin-testing their patients serves to keep them tuberculosis-minded.

The tuberculin-testing program has created a common opinion concerning tuberculosis rather than the diversified opinion that previously prevailed among the medical profession in the two counties under discussion. Tuberculin-testing surveys and the tuberculin testing of private patients, plus a common opinion about tuberculosis among the members of the medical profession, create a tuberculosis-minded public and a unified opinion of the public about tuberculosis. We believe that this is important for the success of any control program.

It has been our experience that contact cases who have had a negative x-ray picture of the chest rarely come back for further check-up unless pressed to do so by the public health worker. A patient who has had a tuberculin test is much more apt to be interested in and concerned about tuberculosis than is the patient who has not been tested. Many patients who do not react to tuberculin have the test repeated each year.

In our experience several from this group became reactors in later years; one case of active pulmonary tuberculosis was found, and in two cases the source of infection was discovered. O. W., a young boy, who was first tested in high school, had three annual negative tests. On the fourth, he reacted and the x-ray film revealed a minimal lesion. His mother was found to be the source of infection. She had a far-advanced lesion and a positive sputum. A teacher, who was a nonreactor when first tested, became a reactor two years later. A study of her recent contacts revealed a previously undiscovered active case of tuberculosis in a friend with whom she had vacationed the previous summer.

A large percentage of the reactors continue to have an annual x-ray check-up of the chest as a precautionary measure. Several cases of active tuberculosis have been discovered in this group.

An incorrect diagnosis of pulmonary tuberculosis may react detrimentally to the tuberculosis control program. We had a patient with active pulmonary tuberculosis who refused sanatorium care because she thought she could get well at home. A friend had been diagnosed as having advanced pulmonary tuberculosis, refused to go to a sanatorium, and recovered in a short period at home. On the other hand, the patient knew several people who had gone to the sanatorium and died. This patient later died from tuberculosis; four of her five

children also died from pulmonary tuberculosis between the ages of 16 and 19. A tuberculin test might have prevented this tragedy by revealing this woman's friend to be a nonreactor.

If the patient fails to react to tuberculin, the diagnosis of tuberculosis should be withheld until definitely proved by a confirmed positive sputum. We find the tuberculin test a most reliable and valuable diagnostic aid. The recent procedure of x-raying the chest without doing a tuberculin test is producing many incorrectly diagnosed cases of pulmonary tuberculosis. A study of the draft rejectees for tuberculosis will confirm this statement.

Two industries in our county routinely x-ray all employees, but do no tuberculin testing. Quite frequently,

a patient sent to the sanatorium with a diagnosis of pulmonary tuberculosis fails to react to tuberculin. The patient is refused employment or discharged because of an incorrect diagnosis. In another industry all employees and applicants are given tuberculin tests; only the positive reactors are x-rayed. Not a single case of far-advanced tuberculosis has been discovered in this industry since the adoption of this plan. In this as in other instances the tuberculin test has proved to be the most effective single factor in the program for the control of tuberculosis in the two counties under consideration.

The use of the tuberculin test made it possible to control tuberculosis in cattle and the use of the same test may prove to be the most effective agent we have for controlling tuberculosis in man.

## The Doctor of Medicine and His Responsibility\*

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**M**EMBERS of the North Central Medical Conference, representing the states of North Dakota, South Dakota, Minnesota, Wisconsin, Nebraska, and Iowa, have entrusted me with the responsibility of addressing this National Conference on Medical Service concerning medical problems that are of both local and national interest.

It is the duty of every doctor of medicine to prevent illness, to supply adequate medical care to those who are ill, to perpetuate the science of medicine, and to engage in medical investigation. It is true that the average physician would prefer to go unregimented among his patients and administer to their needs, irrespective of race, color, creed, or financial status, rather than busy himself with administrative and political problems. However, since the courts have ruled that group health is a business and have found that medical societies are guilty of restraining trade when attempting to maintain the standards of the practice of medicine, a challenge has been issued to the medical profession: Is there a necessity for lay groups and the federal government to take over the control of the practice of medicine?

Has the science of medicine reached its zenith? Have the men and women of medicine become so decadent that they are unable to assume their responsibilities? Are the doctors of medicine no longer able to conduct their practice without government control? Do they lack ability to appreciate their problems? Or are they incapable of constructive leadership in the solution of the numerous responsibilities that are confronting the medical profession today? The reply is, "No".

The science of medicine has been nurtured by men and women who have advanced the knowledge of relieving pain; correcting deformities, lowering infant mortality, prolonging life, and preventing illness by sanitary

and public health measures. This progress must continue if civilization is to survive.

The medical profession is conscious of social and economic changes and stands ready to cooperate with, and offer leadership to, state and federal agencies in the solution of medical problems. It further believes that better medical service can be rendered by offering advice and leadership to welfare agencies than by serving as a tool of political bureaus.

The medical profession recognizes the necessity of state and federal control of communicable diseases and medical services to inmates of state and federal institutions. It appreciates its responsibility to the armed forces and expects to supply the needed personnel. It is willing to cooperate with welfare agencies in providing adequate medical care for the low-income and indigent groups of the population; but in providing this care, it believes that the medical service is augmented when the patient-physician relationship can be maintained by permitting the patient, whenever possible, to choose his own physician. In order to protect the public from worthless, so-called medical procedures and unnecessary operations by unscrupulous individuals, it likewise believes that high standards of medical education and practice must be maintained. This applies not only to the practice of medicine in the office; it applies to the practice of medicine in the humble home or in the most modern hospital.

Although medical education begins in the medical school, it is never completed as long as the physician continues his practice. Medical schools have adopted standards of education and have required certain courses of study in order that the public might avail itself of the best practices of medicine. Medical licensing boards have further protected the public by requiring of their candidates for licensure prescribed courses of study. State laws governing the practice of medicine and con-

\*Read at the meeting of the National Conference on Medical Service, February 14, 1943.

duct of physicians further protect the public from irregular practices and charlatans.

Medical societies, county, state, and national, have been organized to further the education of the physician by acquainting him with the advances and new discoveries in the science of medicine. They likewise serve as administrative units in the consideration and solution of medical problems. It is obvious that the responsibilities of the respective state organizations are greater than those of the county organizations, and that the national organization is charged with greater responsibilities than those of the state organizations. However, it is also obvious that the activities of all groups must be integrated if medical problems are to be solved effectively. In some states, such as Minnesota, the administrative and the legislative bodies have the confidence of the medical profession. Likewise the medical profession has the confidence of the state administrative and legislative bodies. This confidence has made it possible for representatives of both groups to attack and solve the medical problems which are of mutual interest.

The national organization, through its respective bodies and committees, has done excellent work in furthering medical education. It has crystallized the standards of medical education for the medical student as well as for the practitioner of medicine; it has investigated the claims of new and nonofficial remedies, foods, and therapeutic measures and has further protected the public by approval or disapproval of the articles investigated. It has taken active steps through its Procurement and Assignment Committee in providing medical men for the armed forces, without robbing communities of adequate medical personnel, and has made provisions for relocation of physicians where more medical service is needed. It has acquainted the public with the important role that the science of medicine plays in their daily lives, but apparently it has not gained the confidence of the national administrative and legislative bodies as have some of the state medical societies. The National Physicians' Committee has made some progress in acquainting the public with the necessity of medical science, but it too has not obtained the confidence of the national administrative and legislative branches of our government. Therefore, the recent court decision has emphasized the weakness of the educational program so far conducted for the purpose of acquainting the public, the administrative and legislative bodies of certain states, and the national institutions with the important function of the science of medicine in our civilization. It is our duty, as physicians and citizens, to assure those in administrative positions and legislative bodies that we are familiar with the social and economic changes that have thrown greater responsibilities on the medical profession and that we stand ready to cooperate with these agencies in offering leadership in the solution of the numerous problems which nonmedical personnel are trying to solve.

The chief medical problem that concerns doctors of medicine and welfare agencies is that of providing adequate medical care to those who are financially unable to procure this care. This group includes those who are indigent and those with low incomes. Medical care, in

its true sense, embraces more than emergency treatment for a particular illness, since it should include a rehabilitation program, such as the correction of deformities and ailments that impair the efficiency of individuals. The rehabilitation program should also provide for adequate and proper diets, physical training, recreation, protective clothing and housing. In most of the cities the indigent are provided with proper medical care through the charity hospitals, where competent physicians give of their services. This same group in the rural districts is not always so fortunate, since local welfare boards are reluctant to provide this care. It is in these situations that the physicians have been overburdened in assuming all the responsibility of providing necessary medical care. Prior to the more recent economic changes, physicians were willing to assume this obligation because those who could afford to pay for professional services attempted to meet their obligations. However, as a result of the recent social and economic changes, the government has taken over more and more control of the civilian's activities, and those with moderate and low incomes have been less willing to assume their obligations of medical care and are insisting that it is the government's duty to provide medical care and that it is the individual's privilege to squander his extra change.

The problems of this group cannot be solved by physicians alone or by federal, state, and local welfare agencies alone. Ours is a joint responsibility. Conscientious leadership by physicians working in cooperation with county, state, and federal agencies can and will bring forth a solution of the problem. Medical service must be rendered, and the physician is willing to give a good portion of his services. But the government must provide reasonable funds for the care of its indigent, as it must provide for catastrophic illness in the low-income group. Nevertheless, those who come within the low-income group should be made to realize that they too owe a responsibility to their local, state, and federal governments and should be encouraged and advised in budgeting their incomes.

Industrial compensation has accomplished much in providing proper medical care and the necessities of life during illness for those employed in industrial institutions. However, there still remain a large group of individuals who receive moderate or low incomes and are desirous of securing the assurance of adequate medical service in the event of illness. Insurance companies have offered this protection through policies covering accident and illness disabilities, but again this protection only partially solves the problem, since many an insuree expects more for his premium than the insurer is able to give. In several states medical societies have attempted to develop medical service plans whereby the insured may purchase from the doctors within the group full medical protection or medical protection for unexpected serious illnesses. In some states, under the farm security program, experimental medical service plans are being tested out in an attempt to find the solution of the problem of supplying medical care to farmers and their families who are being rehabilitated. In some instances physicians are hired to render medical service to indigent and coopera-

tive groups. Even though physicians, welfare agencies, and low-income groups are struggling with the problems of medical service plans, as yet no satisfactory plan for all classes has been developed. The recipients expect more than the vendors can supply for the premiums paid.

These controversies give rise to discussions on the necessity of compulsory medical insurance. Should such a program evolve, results would be disappointing from the patient's as well as the physician's points of view if placed under the control of political bureaus, and the patient would be deprived of his free choice of physician.

Therefore, we as physicians believe that a more equitable solution of the perplexing medical problems referred to will be reached if we are permitted to consult and advise administrative officials, legislative bodies, and welfare agencies, since we are more familiar with the medical needs of our respective communities than are those who have a casual knowledge of the medical necessities.

It is befitting to quote the statement found in the opinion written by Justice Miller of the United States Court of Appeals of the District of Columbia, in the case of the United States of America versus the American Medical Association, and the case of the United States of America versus the Medical Society of the District of Columbia. The italics are mine.

*"It may be regrettable that Congress chose to take over in the Sherman Act the common law concept of trade, at least to the extent of including therein the practice of medicine. Developments which have taken place during recent decades in the building up of standards of professional education and licensure, together with self-imposed standards of discipline and professional ethics, have, in the belief of many persons, resulted in substantial differences between professional practices and the generally accepted methods of trade and business. As we pointed out in our earlier decision, the American Medical Association and other local medical associations have undoubtedly made a profound contribution to this development. However, our task is not to legislate or declare policy in such matters, but rather, to interpret and apply standards and policies which have been declared by the legislature. That Congress did use the common law test there is no doubt. That Congress was not otherwise advised was perhaps because of the failure of the professional groups to insist upon the distinction and to secure its legislative recognition."*

Does the medical profession of this country need a stronger invitation or a more direct challenge to take an intelligent, helpful, and fair stand in the enactment of legislation that concerns not only the public welfare but the welfare of medicine itself? Does not the medical profession of this country, as citizens and taxpayers, have a right to express its opinion in these matters before legislation is enacted and rules and regulations adopted by some bureau? I do not share the opinion that the time for the medical profession to speak up is after such things have taken place. Neither do I believe that Con-

gress would be resentful of intelligent, courageous, and fair advice on such matters. What better proof can be asked than the quotation from Justice Miller's opinion that the Court is not responsible for the absence of advice from the medical profession when Congress is drafting a law?

It is not the purpose of this paper to criticize the efforts of our national medical organization nor to criticize the efforts of the National Physicians' Committee, but it is the desire of the members of the North Central Medical Conference to express a wish that a more active program be conducted to acquaint the public, government officials, and legislative bodies with the necessity of medical science and the important role it plays in our civilization. It is essential that we as physicians dispel the fear that government administrative agencies and legislative bodies have of our medical organizations and that they be assured of our cooperation in solving the social and economic problems that confront us as a nation.

The functions of acquainting the public on matters of medical interest, assisting bureaus in formulating plans on medical care, and offsetting constructive advice on proposed medical legislation rightfully belong to the national organization known as the American Medical Association. They could be assigned to the National Physicians' Committee, or they might even be undertaken by unifying the activities of the various state committees on public policy and legislation. Representative committees could be appointed for each of the component societies, county, state, and national. These could all be so integrated that national opinion and advice could be obtained and made available for committee hearings on legislation within a few hours' time. Through the national, state, and county committees the entire profession could be informed of proposed medical legislation. Thus the local constituents of the respective state and federal legislators could express their views before legislation is enacted. Some states already have medical advisory committees from each county. They also have state medical committees on public policy with a physician as part-time executive chairman assisted by legal counsel. A national committee constructed on the same plan as these state committees would have to be created. A physician who has practised medicine should be chosen as the executive chairman. Both he and his legal counsel would need to be stationed in our national capital. The expense of the national committee on public policy could be financed by one of three agencies, the American Medical Association, the National Physicians' Committee, or the respective state organizations bearing the expense jointly. It would appear more equitable if each physician would be assessed each year for the specific purpose of maintaining a national committee on public policy and legislation.

Our problems are not unlike those of dentists and hospital associations. Therefore, unified effort of medical, dental, and hospital associations should further the welfare of the patient.

# Echinococcus Cyst of the Lung

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**T**HE purpose of this short article is to present some illustrations showing echinococcus cyst in the lungs. These cases were found during routine examination for tuberculous infection of inhabitants of the mountains of Cordoba, Argentina. The altitude here is 8,000 feet above sea level. The chief occupation of the persons included in the survey is the herding of sheep.

Echinococcosis of the lungs can be primary or secondary. It is primary when the infection of the lung is produced by an embryo hexacante which originates from a *Taenia echinococcus* egg in the organism derived from vegetables or contaminated water. Secondary echinococcosis occurs when the pulmonary involvement is produced by organisms which belong to another hydatid cyst already developed in the body. Generally speaking, the primary echinococcosis of the lung is single, the secondary is multiple.

When the hexacante embryo finds a place where it can live in the lung, a hydatid cyst is developed. The cyst is formed by a laminated membrane and a parenchymatous layer and contains hydatid fluid. The primary function of the laminated membrane is to protect the delicate development of scoleces within the cyst. It also has very special properties of permeability which serve to retain the specific fluid and to prevent the entry of noxious substances into the cyst. The germinal layer lines the interior of the laminated membrane. This germinal layer is variously called endocyst, parenchymatous or embryonic membrane; it produces germinal buds (scoleces).

In the interior of the cyst there is a colorless limpid fluid described by the French as *l'eau de roche*, water of rock. Its function is to act as a protective buffer to the developing scoleces and as a nutritive medium. In addition, toxic substances are present in variable amounts; anaphylactic symptoms can also be produced by its injection into sensitized subjects and antibodies form in the blood of the host.

As the cyst enlarges it may exert pressure on various structures. Since practically any organ may be affected, it can readily be understood that bizarre and protean manifestations may be produced. The development of the cyst in critical centers is usually detected early because of the symptoms produced. Owing to the extremely slow growth and to the fact that infestation occurs most frequently during the growing period, compensatory changes frequently occur. This is one of the explanations of the latency of even the enormous, uncomplicated cysts sometimes observed. As the cyst enlarges it may encroach on the natural channels, such as bile ducts or bronchi; it may rupture into a hollow viscus or even discharge through the external skin, though the latter occurrence is rare. It is easy to understand that the rupture of the cyst may be followed by the introduction of a micro-organism and suppuration may follow.

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## DISTRIBUTION OF CYSTS IN ADULTS AND CHILDREN

Man may be infected by eating contaminated mutton or vegetables or drinking contaminated water. It is well known that dogs and sheep are the most important sources of infection. Unlike the cyst stage of other cestodes, which is often restricted to a particular tissue, hydatid cyst has been recorded in practically every tissue of the body. Transport of the embryo by means of the circulation explains all the facts concerning distribution. The great majority of embryos carried by the portal blood stream are arrested in the liver, and about 70 per cent of primary cysts are found in that organ. However, owing to the relatively small size of the embryo, it may pass through the liver capillaries and lodge in the lungs, which are next in frequency of affection.

The distribution of cysts in children under the age of fifteen reveals some striking differences from the figure for adults. Doubtless such figures give a much truer conception of the distribution of primary cysts. While the liver and the lungs account for more than 80 per cent, the percentage of intracranial cysts is much higher than in adults. It will be noted that cysts of the brain are about seven times more frequent in children than in adults. This fact has recently been emphasized by several South American writers.

## CLINICAL ASPECTS

Simple uncomplicated cysts are most frequently seen in children or young adults. The latency of the disease is striking and many cases have been recorded in which enormous cysts have existed for years without causing serious symptoms. In general the health of the patient is remarkably good; not infrequently the disease is discovered by an observing mother or during a routine examination for some other reason, as in our cases.

## DIAGNOSIS

Diagnosis can be made from: (1) high eosinophilia in the presence of other symptoms; (2) the complement fixation test; and (3) the intradermal test. If the cyst is in the lung, it may be detected by its radiological aspect. Of importance is the residence of the patient and the kind of work he performs. It is also pertinent to know if he is a sheep-raiser or if there are dogs where he works.

**Complement Fixation Test:** The principles of the Bordet-Gengou reaction were first applied to this disease by Ghedini. Weinberg investigated these reactions in various helminthic infections, including hydatid disease in sheep, and later called attention to the value of this diagnostic method in human cases. It is a specific test and depends on the presence of a specific antibody in the serum of patients who have absorbed hydatid antigen. This antibody, in the presence of specific antigen, com-

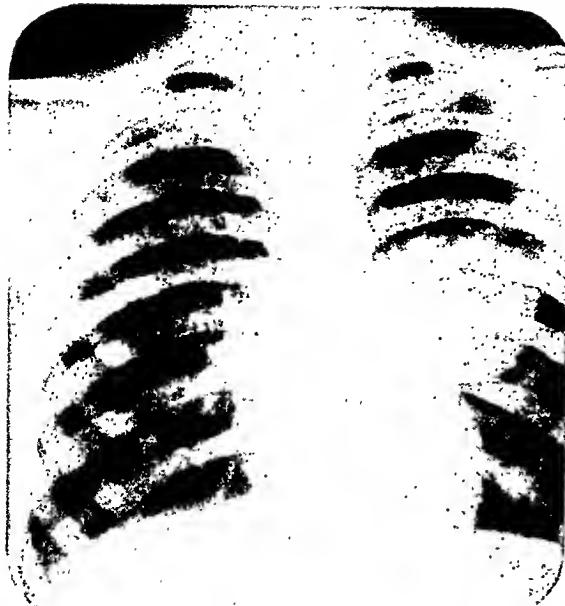


Fig. 1

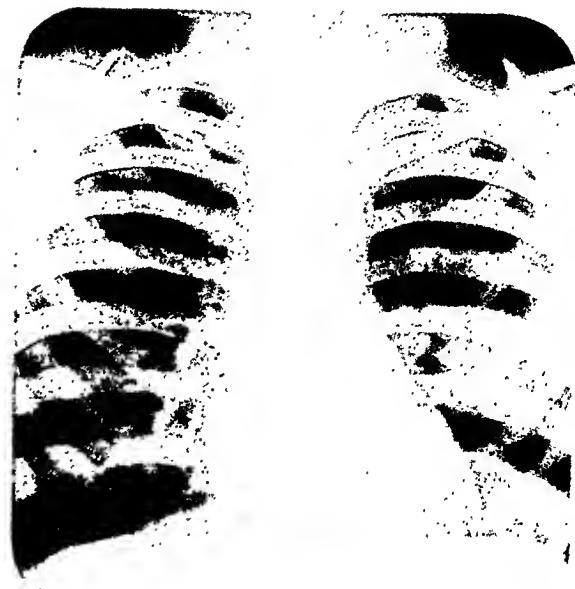


Fig. 2

bines with normal complement; the latter cannot be demonstrated by means of a sensitized system of red blood cells and specific hemolysis. The test is performed in the same way as the Wassermann test, the presence of hemolysis indicating that the complement has not been fixed.

*Intradermal Reaction of Casoni:* The occasional occurrence of urticaria, erythema, and other symptoms suggestive of anaphylaxis, following the rupture or exploratory puncture of a cyst, directed attention to the presence of skin sensitiveness in cases of hydatid infestation. A cutaneous test, carried out like that of Von Pirquet, yielded indefinite results but Casoni was able to obtain a high percentage of positive cases in patients with hydatid disease when hydatid fluid was injected intradermally. This test is the most satisfactory.

#### COMPLICATIONS

As echinococcus cyst may develop in any part of the body, complications are in accord with the location; that is, evolution in the lungs produces suppurative abscess, which, if it opens into the pleural cavity, causes hydatid pleurisy, suppurative pleurisy and often pyopneumothorax. Development in the abdomen causes hydatid peritonitis, or growth of a cyst in the brain induces pyo-hydatid peritonitis, meningitis and all the symptoms of brain tumor.

#### TREATMENT

Benign hydatid cyst can be removed if it is in an operable site. If possible, the cyst must be enucleated; otherwise, it should be drained by aspiration and made the marsupialization of the cavity. No known chemotherapy is of any avail.

## Don't Give Up the Tuberculin Test

Oscar Lotz, M.D.\*

Milwaukee, Wisconsin

FOR a Badger medic to remind Gopher medics not to give up the tuberculin test certainly suggests "carrying coals to Newcastle." With Minnesota's splendid record in the eradication of bovine tuberculosis; with its widespread case-finding program reaching out from every sanatorium to the highways and byways of the state; with well-organized student health services in its colleges; and with its recently inaugurated program

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of county accreditation—all of which projects are fundamentally based upon the use of the tuberculin test—it does seem a bit out of order for Wisconsin to shout the warning, "Don't give up the tuberculin test!" to our progressive and friendly neighbor across the Mississippi. I may perhaps be accused of shouting "Wolf, Wolf" without real cause. Nevertheless, I believe there are certain signs and indications which warrant our attention and which, if permitted to develop unheeded, may result

in the loss of one of the important—if not the most valuable—educational measure in the entire program for the control of tuberculosis.

In our anxiety to bring tuberculosis under control it is, of course, perfectly natural that whenever and wherever possible we make use of the best and most modern means available. Case-finding by means of mass surveys of fertile groups is the order of the day and without question has brought to light many minimal cases which might have gone on to advanced involvement but for the newer diagnostic methods. Modern equipment, especially the miniature films produced by the photo-fluorographic units, has made these mass studies economically possible. Their value cannot be overestimated. In this statement I am assuming that today no physician is justified in assuring his patient that active pulmonary tuberculosis is not present unless the patient has been fluoroscoped by a person with considerable training or has had a chest film interpreted by a person of experience.

For many years the intradermal tuberculin test has been used as a screen to separate the infected from the noninfected. Today the miniature film is used as a screen; unfortunately, for very good practical reasons, no testing is done. This is particularly true in industry. With all plants geared to top speed, and with maximum production the chief objective, employers are reluctant to give up any more of their employees' time than is absolutely necessary, even for so valuable a project as health examinations. In one of our recent studies all examinations had to be done during the change of working shifts, so that for several nights our workers—nurses and technician—had to be on the job from 11 P. M. to 1 A. M.

In brief, the omission of the tuberculin test in favor of the mobile photofluorographic unit has been the chief cause for my concern.

Two recent incidents tend to confirm or at least to strengthen these fears. One was a well-authenticated report that a health officer of one of our north-central states informed his audience, consisting of public health nurses and tuberculosis workers, that "the tuberculin test today is passé, and since the only method of making a diagnosis of minimal tuberculosis is by means of the x-ray, to do the tuberculin test is a waste of time and money." The other occurrence was the impression of one of our clinic workers. For many years an assistant in stethoscopic, tuberculin-testing, and fluoroscopic clinics, she recently had occasion to assist at a 35-mm. photo-fluorographic clinic, where a large number of chest films were taken within a comparatively short time. Her reaction was anything but favorable and was based entirely on the feeling that while many more persons could be examined during the miniature film clinic, the speed at which these patients were rushed through gave no opportunity to educate the individual in matters of tuberculosis. She has always felt that these personal contacts between workers and clients were of the greatest educational value.

#### VALUE OF THE TUBERCULIN TEST

And now, as to the value of the intradermal tuberculin

test. Space does not permit going into detail, but just a word or two as to its various possibilities may act as a reminder of its real value.

*As a Diagnostic Measure:* Properly given and used in sufficient dosage, the tuberculin test, we believe, is specific for tuberculous infection. There are exceptional cases, but no test that I recall is 100 per cent infallible.

The tuberculin test gives information that no other diagnostic measure provides. The x-ray film is necessary to find the early lesion, but in the majority of cases it will not reveal the presence of tuberculous infection. If we are to carry through our program of tuberculosis control to the point of eradication we must know who harbors the germ.

Because of the relatively low incidence of infection, compared to that of years ago, the value of the test is now greatly enhanced. Formerly the infection rate among children was high, and among adults almost universal. Today, especially in our mid-central and western states, the infection rate is low. This makes the negative reaction an important factor in differential diagnosis.

Modern research in medicine has, during recent years, recognized and identified many general diseases with pulmonary involvement simulating pulmonary tuberculosis. The tuberculin test is absolutely essential in diagnosing these cases.

*In Case-Finding:* The small film produced by means of the modern photofluorographic unit is, without question, the most economical and easiest method of finding cases with pulmonary lesions. However, to be thorough we must go beyond the finding of the active case. The tuberculin test will bring to light many carriers of tubercle bacilli missed by the x-ray. Following the reactors through to their possible sources, especially in children, will result in finding many more cases than the films alone will unearth. The younger the children, the more productive the results.

*As an Educational Measure.* The program for the control of tuberculosis advanced by the National Tuberculosis Association and its affiliated branches is based primarily on education as the principal weapon. In our campaign against this disease, literature, exhibits, lectures, moving pictures, demonstrans, etc., by means of which the story of tuberculosis is brought home to child or adult, to the individual or the masses, are all of unquestioned value. However, I sincerely doubt if any of these carry the same significant lessons and the long-lasting impression that does the intradermal tuberculin test. The entire procedure—the presence of the nurse and the doctor, the actual skin injection, the anxiety as to the result and, if positive, the need of the x-ray—is all so impressive to both child and adult that it by far exceeds in value any other educational measure.

That the newer methods of case-finding with the tuberculin test are a great addition to our program is not questioned for a moment, but I do wish to sound the warning that by the omission of the tuberculin test we may at some future time have to pay dearly for our neglect to use this valuable agent in the education of coming generations.

"Don't give up the tuberculin test!"

# Tuberculosis Among College Students\*

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**I**N times of war our attention quite naturally becomes more sharply focused on physical fitness. Under conditions imposed upon us through involvement in "total" war, the demands for physical and emotional stamina extend far beyond the ranks of our armed forces. Our entire civil population is being called upon for greater effort and greater efficiency. Moreover, this challenge comes at a time when we face various restrictions which make necessary certain readjustments in our accustomed routine of living. It is conceivable that conditions more exacting than those which now confront us may dominate our national life for an extended period of time. Although such an outlook provides no sound basis for undue alarm, there is obviously a clearly defined need for intelligent medical planning. Measures for the protection of the public health should be provided on a broader front than ever before.

Numerous warnings have been issued recently to the effect that increased death rates from various diseases may be anticipated during the next few years. It is well known that tuberculosis mortality increased tremendously in many European countries following the first World War. In the United States, however, in the absence of extreme conditions of deprivation, exposure, and starvation so prevalent among European nations, it is hardly to be expected that a sharp rise in tuberculosis deaths will occur. It is quite probable, however, that a slight increase in the mortality rate may be observed, or at least the steadily downward trend evident in recent years may be halted temporarily.

Progress in tuberculosis control in this country during recent years has been most encouraging. According to a recent report by the Metropolitan Life Insurance Company<sup>1</sup> the tuberculosis death rate for white males of all ages declined 80 per cent during the interval between the drafts of World War I and the present conflict. For men at the selective service ages the decline was almost 90 per cent. This achievement is all the more noteworthy in view of the fact that our armamentarium for combating tuberculosis has not been fortified by new developments such as vaccine, an antitoxin, or effective chemotherapy. It represents one of the outstanding accomplishments in the entire field of public health since the turn of the century.

## TEN YEARS OF COLLEGE TESTING PROGRAMS

The sustained and far-reaching educational campaign directed against tuberculosis over a long period of years has been one of the most important factors contributing to the markedly improved death rate. In college health circles the practical value of such an educational program is clearly in evidence. The first organized effort to develop a comprehensive program of tuberculosis control among the nation's college students had its inception in

1931. Since that time the number of institutions which have set up case-finding programs has increased in a striking manner. The report of Ferguson<sup>2</sup> shows that from a modest beginning in 1931, when six colleges reported a tuberculosis program, the number increased steadily during the next five years. For the second five-year period, as reported by Lyght,<sup>3</sup> further substantial gains were made. In the school year 1940-41 there were 304 institutions conducting active programs for the control of tuberculosis among their students.

During the academic year 1941-42, with which this report deals, many colleges and universities experienced a decrease in student enrollment due to enlistment in the armed forces of a considerable number of college men. Many student health departments suffered rather heavy losses in personnel and there were other disturbing factors. In spite of these unfavorable influences and contrary to our expectations, we are able to report a slight net gain in the number of case-finding programs over last year. Also, the number of colleges reporting to our committee reached a new all-time high. Of 860 institutions contacted by letter and questionnaire, replies were received from 488, or 56.7 per cent. Much credit is due to many of our state tuberculosis associations for their most helpful cooperation during recent years. In numerous instances they have made it possible for certain institutions to establish programs of tuberculosis case-finding by enlisting the aid of the state health department or other health agency. Undoubtedly there are many more colleges which would welcome such assistance. It should be remembered, of course, that not all colleges have an organized health program and many college communities, because of their location, do not have access to adequate x-ray facilities. It would seem that this group of institutions merits special consideration by the Tuberculosis Committee during the coming years.

We realize that much remains to be done when we remember that this year 372 colleges failed to respond to our two requests for a report on their activities. Of 860 institutions contacted by the Committee, 311 reported some form of tuberculosis program in effect during the year. This means that 549 colleges, or approximately 64 per cent of the country's total, presumably do not employ modern tuberculosis case-finding methods. The total enrollment at these institutions is probably in excess of 300,000 students. Since the prevalence of tuberculosis among university students is approximately 2 per 1,000, we are justified in assuming that on the campuses of these 549 colleges there are some 600 students who have unrecognized pulmonary tuberculosis. This is not a pleasant picture when we think of the future in store for many of these young men and young women. Few diseases impose such costly and far-reaching penalties for failure of early diagnosis as does tuberculosis. The years of disability and suffering and the financial costs

\*Twelfth annual report of the Tuberculosis Committee, American Student Health Association, for the academic year 1941-42

involved will reach staggering proportions. The number of persons who will be infected by certain members of this group will undoubtedly be large. Numerous deaths will occur.

Since the cost of a tuberculosis survey of the student group is not infrequently given as the reason for failure to sponsor such a program at some colleges, let us consider this item as applying to these 549 institutions. Based on average costs of surveying such a group, including tuberculin tests and x-raying positive reactors, an expenditure of \$100,000 divided among these institutions would provide an adequate case-finding program for their 300,000 students. On this basis, the cost of finding each of the estimated 600 undiagnosed cases would be \$166. No one familiar with the problem will question the tremendous values which accrue to the individual and to the community through the early diagnosis of tuberculosis. A program designed for the early detection of the disease among students may, by some, be deemed expensive. Failure to provide such a program, however, will invariably prove infinitely more costly.

#### DECREASE IN TUBERCULOSIS RATES

The tuberculin test provides the most sensitive and reliable index of the prevalence of tuberculous infection in a young adult group. In view of the sharp decline in tuberculosis mortality among white persons in this country between 1920 and 1940, 73 per cent in females and 63 per cent in males, one would naturally expect that the number of persons becoming infected with tubercle bacilli during this period would also show a significant decrease. Unfortunately, there are no published data on the incidence of tuberculous infection among college students dating back to 1920. One of the earliest reports on the results of tuberculin testing of a student group was based on a study conducted at the University of Minnesota<sup>1</sup> in 1928. Tests with the Pirquet method showed the incidence of positive reactions among approximately 2,000 students to be 31 per cent. At the same institution in 1941-42, using the two-dose Mantoux technic, the incidence of infection among 5,481 students was 17 per cent. This represents a reduction of 45 per cent over a period of thirteen years. At the University of Pennsylvania 48 per cent of entering students reacted to tuberculin in 1932 as compared with 38.5 per cent in 1942.

Table IV presents the results of tuberculin testing at 104 colleges located in all parts of the United States, 1941-42. The reports from all of the institutions included in this summary indicate that an adequate dosage was employed. It will be noted that for the country as a whole 21.8 per cent of students react to tuberculin, a rather surprisingly low figure. Comparing these results with those reported by Long<sup>2</sup> for the year 1934, it is apparent that tuberculous infection is becoming definitely less prevalent among college students. This no doubt reflects the generally improved conditions which prevail today with reference to tuberculosis, especially among persons of the social and economic group represented by college students. As will be seen in Table IV,

the east and west coast areas have a higher infection rate than other sections of the country.

Table VI presents a summary of the new cases of tuberculosis discovered at universities and colleges throughout the country during the college year 1941-42. Here is substantial proof of the real value of the tuberculosis program for the nation's institutions of higher learning. A total of 817 cases of tuberculosis were diagnosed during the year; this number includes only those formally reported to the Committee. No doubt many additional cases were discovered at institutions which, for various reasons, have never filed a report. Of the 817 newly discovered cases, 755 were among students, 22 among food-handlers and 40 among faculty members, administrative officers, and employees. Clinically active cases among students numbered 263, and 246 students withdrew from college to undergo treatment.

#### ADEQUATE METHODS OF INVESTIGATION

In previous reports by this Committee, attention has been called to the strikingly different results obtained by those colleges with and those without a modern case-finding program. Unfortunately, many of the older ideas relating to tuberculosis seem to be still firmly entrenched in the minds of many people. The belief is all too prevalent that early tuberculosis gives rise to the early symptoms of the disease. We receive reports of various procedures used at certain institutions for the follow-up of "suspects." "Weighing at frequent intervals," "frequent temperature readings," are among the more common of these. The "suspects" are usually those students who are rather markedly underweight. It would seem, therefore, that the Committee is justified in again emphasizing the fact that the tuberculin test and the chest x-ray provide the only adequate means for the early detection of tuberculosis in the vast majority of cases.

As shown in Table VI, the 311 colleges which routinely provided supervision for their students, using modern and accepted methods, found 744 new student cases of tuberculosis. On the basis of total enrollment at these institutions, which does not indicate a true prevalence since the entire group was not examined, this is a rate of 133.5 new cases per 100,000 students. This is indeed in striking contrast to the 11 cases diagnosed at 177 institutions where no case-finding program was employed, the rate here being 7.53 per 100,000. In other words, colleges with a definite control program discovered new cases of pulmonary tuberculosis almost eighteen times as frequently as did those colleges with no program. Such evidence, provided year after year by the Committee, should leave no doubt as to what constitutes an adequate program of tuberculosis control for a student group.

Is there any evidence which indicates a decrease in the prevalence of tuberculosis among college students? Although, as pointed out above, we cannot speak in exact terms of prevalence of tuberculosis as applying to the country's student population, reports available to the Committee over a period of years seem to indicate rather definite improvement. In the 1940-41 annual report of

TABLE I  
Questionnaire Survey of Tuberculosis Case-Finding in American Colleges and Universities, 1941-42

	Institutions Contacted	Replies Received	Programs Reported
Maine	7	4	2
New Hampshire	7	3	3
Vermont	6	2	1
Massachusetts	41	22	14
Rhode Island	6	4	4
Connecticut	12	12	8
	79	47	32
New York	59	25	14
Pennsylvania	64	32	20
New Jersey	20	14	11
Delaware	1		
Maryland	17	8	4
District of Columbia	9	5	3
	170	84	52
Virginia	18	9	7
North Carolina	22	10	7
South Carolina	15	8	3
Georgia	15	6	5
Florida	7	5	4
	77	38	26
Oklahoma	16	9	6
Arkansas	11	4	3
Tennessee	27	11	2
Mississippi	9	6	2
Alabama	13	4	1
Louisiana	13	1	
Texas	32	11	2
	121	46	16
North Dakota	9	6	5
South Dakota	8	3	2
Minnesota	21	15	15
Wisconsin	27	21	16
Michigan	24	22	13
Ohio	47	34	22
West Virginia	14	12	9
Indiana	27	20	14
Illinois	43	27	15
Iowa	26	14	7
Nebraska	16	10	5
Kansas	21	11	7
Missouri	22	15	6
Kentucky	17	7	6
	322	217	142
Montana	6	6	3
Idaho	3	3	1
Wyoming	1	1	1
Nevada	1	1	1
Utah	4	1	
Colorado	9	8	7
Arizona	3	2	2
New Mexico	4	3	2
	31	25	17
Washington	16	9	7
Oregon	11	4	4
California	33	18	15
	60	31	26
Grand Total	860	488 (56.7%)	311

TABLE II  
States With Highest Percentage of Colleges Reporting Tuberculosis Control Programs, 1941-42

	No. Institutions Contacted	No. Reporting Programs	Per Cent
<b>Group I (States with less than 10 accredited institutions):</b>			
Wyoming	1	1	100
Nevada	1	1	100
Colorado	9	7	77.7
Arizona	3	2	66.6
Florida	7	4	57.0
North Dakota	9	5	55.5
Montana	6	3	50
New Mexico	4	2	50
<b>Group II (States with more than 10 accredited institutions):</b>			
Minnesota	21	15	71.4
Connecticut	12	8	66.6
West Virginia	14	9	64.2
Wisconsin	27	16	59.2

New Jersey	20	11	55.0
Michigan	24	13	54.1
Indiana	27	14	51.8

TABLE III  
Testing Techniques in 254 Colleges Reporting Tuberculin Testing Programs, 1941-42

Testing Method:	
Mantoux intradermal	182
Vollmer patch test	54
Pirquet	4
Combined Mantoux and patch test	3
Unspecified	11
Testing Material:	
Purified protein derivative	93
Old tuberculin	89
Combination of the two	1
Testing Dosage:	
Two-dose technic	63
Single large dose	35
Single intermediate dose	37
Single small dose	37
Combination of dosages	2
Testing Routine:	
New students and all negative reactors annually	63
New students only (no retesting)	49
New students and all seniors	29
Test optional (available to all annually)	47
Other testing routines	46

TABLE IV  
Tuberculin Testing of College Students in 104 Colleges (By States and Various Geographical Areas, 1941-42)

	No. Tested	No. Positive	Per Cent Positive
Maine, New Hampshire, Connecticut, Vermont, Massachusetts, Rhode Island	3,390	1,164	34.3
New York, Pennsylvania, New Jersey, Maryland, Virginia, West Virginia	7,143	2,072	29.0
North Carolina, South Carolina, Georgia, Tennessee, Alabama, Mississippi, Florida	4,208	719	17.1
Ohio, Kentucky, Indiana, Illinois, Michigan, Wisconsin, Missouri, Minnesota, Iowa	37,665	7,230	19.4
North Dakota, South Dakota, Kansas, Idaho, Montana, Utah, Wyoming, Colorado, Nebraska	6,775	1,279	19.0
Arkansas, New Mexico, Louisiana, Oklahoma, Arizona, Texas	5,122	951	18.5
Washington, Oregon, California	8,744	2,542	29.0
Total	73,047	15,957	21.8

TABLE V  
X-Ray Procedures Reported by Various Institutions, 1941-42

254 Colleges Reporting Tuberculin Testing Program:	
Positive reactors x-rayed once	74
Positive reactors x-rayed annually	66
X-ray optional (acceptance general)	60
X-ray optional (acceptance not satisfactory)	10
Other x-ray routines	19
Fluoroscope used routinely to supplement x-ray	38
Fluoroscope used exclusively (chest x-ray when indicated)	12
57 Colleges Reporting No Tuberculin Testing Program:	
Chest x-ray for all new students	22
Chest x-ray for all students annually	9
Other routine x-ray programs	26

TABLE VI  
New Cases of Pulmonary Tuberculosis Diagnosed Among College Students, 1941-42

Institutions with SOME Organized Tuberculosis Program:	
No. of clinically active cases diagnosed	259
No. of apparently arrested cases diagnosed	485
Total new cases reported	744
Institutions with NO Organized Tuberculosis Program:	
No. of students who left college because of tuberculosis	240
No. of institutions reporting	311
Approximate total enrollment	558,075
New cases per 100,000 students	133.5
Total Cases of Pulmonary Tuberculosis Diagnosed 1941-42:	
Student cases newly diagnosed	755
Food-handlers	22
Faculty, administrative officers, etc.	40
Total, new cases	817

the Committee by Lyght,<sup>1</sup> 304 institutions with organized tuberculosis programs reported 966 newly diagnosed cases of tuberculosis. This represents a rate of 177.2 new cases per 100,000 students, based on an enrollment of 545,000. For the five-year period 1936-41, this case-finding rate stood at 190.5 per 100,000. This year the corresponding rate is 133.5. This apparent reduction of approximately 30 per cent may actually be on the conservative side. For during this period, reports from many of our larger institutions conducting excellent case-finding programs indicate an extension of these procedures to include a higher percentage of their students. In terms of total enrollment, therefore, it is evident that more students are being examined each year, and the techniques employed have improved and become more effective.

#### NEW STUDIES IN PROGRESS

During the present school year the Committee has enlisted the cooperation of a group of eastern colleges in a study of entering students. Students matriculating at these institutions number approximately 10,000 annually. It is planned to obtain accurate individual records on all first-year students at these colleges over a period of years. The information to be recorded for each student includes age, home address, name and location of secondary school attended and whether a private, public, or parochial school; tuberculin test technic and results; and chest x-ray findings. If such a large group is studied in this manner over a considerable period of time, much valuable information will be obtained. We shall be permitted to observe differences in the prevalence of tuberculous infection among students from various states and various home communities, and accurate comparisons may be made from year to year. It is hoped that this survey may continue without interruption for a period of ten years or longer. If this is possible, the available data should provide a rather sensitive index of any changes in the prevalence of tuberculous infection and disease among students in this area. The Committee wishes to express its appreciation to the following universities and colleges, and especially to their health service physicians, who have consented to participate in this new project. We realize the effort and expense which is involved.

Amherst College	North Carolina, Woman's College
Bennington College	Pennsylvania State College
Bryn Mawr College	Pennsylvania, University of
Bucknell University	Princeton University
Dartmouth College	Rutgers University
Goucher College	Smith College
Haverford College	Syracuse University
New Hampshire,	Virginia, University of
University of	
Wake Forest College	
Wesleyan University	

This report would be incomplete without mention of the immeasurable educational value of the tuberculosis programs now being carried on so effectively in many colleges and universities. And we in the colleges are fully aware of the same fine work being done in an ever-increasing number of secondary schools. This year over half a million young men and women are enrolled in colleges where modern procedures are employed routinely

for the early detection of tuberculosis. During the past ten years millions of students have been brought into intimate contact with these programs. Fortunately, through the student, the parents are being made aware of the protection thus being provided for their sons and daughters. In this way we are building up a formidable army of intelligent men and women, many of whom will be the future leaders in the campaign against tuberculosis.

#### SUMMARY

Three hundred and eleven colleges and universities, with a total enrollment of 558,075 students, report tuberculosis case-finding programs during the academic year 1941-42.

Seven hundred and forty-four new cases of tuberculosis were diagnosed among the students at these institutions, a rate of 133.5 new cases per 100,000 students.

At 177 colleges which provided no case-finding programs, 11 new cases of tuberculosis were diagnosed among 146,000 students, a rate of 7.5 per 100,000.

The incidence of tuberculous infection among college students has shown a gradual decline during the past ten years. Among 73,000 undergraduate students tuberculin tested in all sections of the United States in 1941-42, there were 21.8 per cent positive reactors.

Reports available to the Committee during the past six years indicate a decline of approximately 30 per cent in the prevalence of tuberculosis among college students during this period.

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until a month before graduation. X-rays at that time showed no evidence of parenchymal disease. Since graduation she has been employed as a supervisor in the hospital. An x-ray taken in August, 1942, disclosed bilateral upper lung pathology.

Two colored students also of the class of 1940 developed reinfection disease during training. Both were negative on admission and developed allergy during their first year. One of them developed a moderately advanced disease which responded well to collapse therapy. The other girl had a pleurisy with effusion which cleared on bed rest. She was out of training for a year, then returned and completed her course. Since graduation she has worked in the hospital and a recent check-up shows her to be in excellent condition.

A colored member of the class of 1943 who entered with a positive reaction also developed pleurisy with effusion in the winter of 1941. Several thoracenteses were necessary to control the fluid. No evidence of parenchymal disease was seen. She has returned to her home and abandoned training.

During the preparation of this paper we have seen an x-ray of another colored girl of the class of 1943, which shows definite parenchymal disease in the left upper lobe. Her tuberculin on admission to training was negative and was still so last fall. Recently, however, it was positive and her chest was x-rayed. She is now receiving pneumothorax.

Table IV compares figures from some other training schools with ours.

#### W.P.A. WORKERS

We have not had the opportunity to study the tuberculin reaction in other white collar groups, but recently we tested 1,000 W.P.A. workers. Their ages ran from twenty-five to forty-five years and both urban and rural residents were included. The following positive results were obtained: white men 64.5 per cent, white women 71 per cent, colored men 80.5 per cent, and colored women 81 per cent. When it is remembered that these individuals are from the lower economic strata, where tuberculosis is common, the comparison of the figures with those of the groups we are reporting is arresting.

#### PREVENTIVE MEASURES

All medical cases admitted to the wards of the University Hospital have an x-ray of the chest on admission. This tends to prevent unsuspected cases of open tuberculosis from being administered to by students, nurses, and hospital personnel. We believe this to be a most progressive policy and hope to see it extended to include every patient admitted, not only medical, but surgical, obstetrical, and all others, both paying and indigent. All patients with respiratory symptoms are supplied with disposable tissues and an effort is made to have them cover nose and mouth when coughing or sneezing. Food-handlers are routinely checked by test and fluoroscope.

Nurses are required to wear gowns and masks when nursing tuberculous cases. In addition they are urged to wash their hands frequently. Medical students wear

TABLE I  
Positive Reactors Among Medical Students

Class	No	Fresh-	Sopho-	Juniors	Seniors	
		men	mores		Beginning of Year	End of Year
1941	37	16 (43%)	17 (46%)	21 (57%)	22 (60%)	23 (62%)
1942	43	24 (56%)	26 (60%)	32 (74%)	32 (74%)	33* (79%)
Total	80	40 (50%)	43 (53%)	53 (65%)	54 (67%)	56 (70.5%)
(Mar.) 1943	46	22 (49%)	28 (60%)	29 (63%)	35 (76%)	
(Dec.) 1943	46	23 (50%)	26 (56%)	32 (70%)		
(Sept.) 1944	68	30 (44%)	46 (68%)			
(June) 1945	76	50 (66%)				
Total Tested	316	240		172	126	80
Total Positive	165 (52%)	142 (59%)		114 (66%)	89 (70%)	56 (70.5%)

\*Four negative reactors failed to take the final test.

TABLE II  
Comparison of Table I with Other Studies

Class	Hahn <sup>1</sup> (Cornell)	Amyer <sup>2</sup> (Minn.)	Stiehm <sup>19</sup> (Wis.)	Keller <sup>4</sup> (Vanderbilt)
Freshman	82%	36%	45%	60%
Senior	92%	68%	55%	69.6%
Class	Baker <sup>3</sup> (La. State)	Sooper <sup>4</sup> (Yale)	Blackford <sup>4</sup> (Emory)	U. of Ga.
Freshman	68%	71%	48%	52%
Senior	98%	94%	..	70.6%

TABLE III  
Positive Reactors Among Nursing Students

Class	Race	Nn.	Probation-	Juniors	Seniors	
			Probation-	Juniors	Beginning of Year	End of Year
1940	White Col.	21	5 (23%)	11 (52%)	12 (57%)	17 (81%)
		24	7 (30%)	20 (83%)	21 (90%)	22 (91%)
1941	White Col.	35	9 (25%)	22 (62%)	28 (80%)	30 (85%)
		30	6 (20%)	8 (27%)	10 (100%)	10 (100%)
1942	White Col.	34	14 (41%)	19 (56%)	23 (70%)	26 (76%)
		15	10 (67%)	15 (100%)	15 (100%)	10 (100%)
Total	White Col.	90	23 (30%)	52 (57%)	63 (69%)	73 (81%)
		49	22 (49%)	43 (85%)	46 (96%)	47 (97%)
1943	White Col.	35	21 (60%)	27 (77%)		
		16	10 (62%)	13 (81%)		
1944	White Col.	40	18 (45%)			
		22	13 (65%)			
Total Tested, White		165		125	90	90
Total Tested, Colored		87		65	49	49
Total Positive, White		67	(39%)	79 (62%)	63 (69%)	73 (81%)
Colored		45	(51%)	56 (86%)	46 (96%)	47 (97%)

TABLE IV  
Comparison of Table III with Other Studies

Class	Phila. <sup>1</sup> General <sup>2</sup>	New York <sup>1</sup>	Boston City <sup>2</sup>	Vanderbilt <sup>4</sup>	U. of Ga.
Probationers	57%	78%	57%	61%	White 39% Colored 61%
Seniors	100%	91.5%	90%	58%	White 81% Colored 97%

masks and are also urged to wash their hands. Medical students have a series of lectures on tuberculosis in the third trimester of the junior year and the nurses during their second year of training. The importance of self-protection is stressed to both these groups.

#### DISCUSSION

We are convinced that annual checking of students and nurses, particularly nurses, is entirely inadequate to properly safeguard health. Tuberculin tests should be made every three or four months and all positive reactors routinely examined by x-ray at the same intervals.

In spite of the fact that preventive measures are in force, it is obvious from a study of the figures presented that too many students and nurses are infected with tubercle bacilli during their period of training. We have also observed that a large number of these recent conversions have very strongly positive reactions. This phenomenon has been previously commented upon.<sup>1</sup> The most severe reaction we have ever seen occurred in a Jewish girl, a member of the class of 1941. Her test was negative on admission but the next fall, in response to 0.10 mg. O. T., her arm swelled to about twice its normal size. At the site of inoculation there was a bleb about the size of a fifty-cent piece accompanied by marked edema. Two axillary glands became quite palpable and tender and she had a temperature of 104° F. The symptoms subsided without untoward effect, but she was so unnerved by her experience she gave up training.

What further steps should be taken to protect these girls? They take their training during the years when tuberculosis is the chief cause of death. Should only girls with positive tuberculin reactions be admitted to training? We have the impression, though so far it is only an impression, that the positive reactors are in a little better position to cope with the infection than those whose reaction has recently been converted from negative to positive. We are doubtful, however, if a sufficient

number of positive reactors could be recruited to fill the rolls. Then, too, this would place an insurmountable obstacle in the path of those negative reactors wishing to take up training.

Since February, 1942, the tuberculous patients in our hospital have been cared for in a separate building by practical nurses under graduate supervision. It will be extremely interesting to see what effect this move has upon the infection rate of succeeding classes of nurses.

#### SUMMARY

In making this five-year study of the tuberculin reaction in medical students and nurses, including figures on colored nurses, two classes of medical students and three classes of nurses have been followed throughout their period of training.

Fifty-two per cent of the medical students were positive on admission and 70.5 per cent on graduation; 39 per cent of the white nurses were positive on admission and 81 per cent on graduation; 54 per cent of the colored nurses were positive on admission and 97 per cent on graduation.

In addition, a comparison with local W.P.A. infection rates is given. Preventive measures practiced in the University Hospital are outlined and further measures for more effective control are discussed.

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## The Examination of Rejectees\*

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**T**HE Department of Health of New York City has provided a complete chest examination for approximately 94 per cent of the men rejected for pulmonary defects at local Army physical examination centers since the first draft call on November 25, 1940. The men examined are those who have been rejected in whole or in part on the basis of pathology as seen in the chest x-rays at the Army physical examination stations. From November 25, 1940, to October, 1942, the Army stations examined approximately 500,000

individuals, or about five-sixths the number (600,000) examined by us in mass surveys between 1934 and 1942. There is every indication to show that within the coming two years an equal or greater number will be examined by the Army; consequently the flow of rejectees to us will not diminish.

The potentialities of this service were fully realized by the Department of Health well before the actual drafting of men started in the fall of 1940. The Army, prior to the actual drafting of men, was committed to the principle of a chest x-ray of each man before acceptance into the armed services. However, the Army was not able to provide the x-ray equipment, nor find men to

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interpret the films at that time. Accordingly, the Department of Health offered to set up and operate this service for the Army until such time as the military authorities could arrange to assume full responsibility. This offer was promptly accepted by the Surgeon of the Second Corps Area. It should be stated at the outset that the effective and efficient program that has been developed here in New York City is in large measure a tribute to the enthusiastic assistance and cooperation of Second Service Command Surgeon, Col. C. M. Wilson, and his staff, and as well the Medical Director of Selective Service, Dr. Samuel J. Kopetsky, and the chairmen of the local draft boards.

The Department of Health provided the entire service for the stations in New York City proper without cost to the Army from November 25, 1940, until January 1, 1941; at this time the Army assumed the cost of the x-ray service, and on January 15, 1941, assigned clinicians to interpret the films. The Department, however, has continued from the outset to provide an examination for the rejectee suspected of having tuberculosis.

There has been the closest cooperation and understanding between the clinicians working in the Army station and those in our clinic. Primarily, this was due to the fact that most of the physicians first assigned by the Army to do this work at stations in New York City were the same men we had assigned during the initial phase of the service, and who had helped to establish the procedures that were adopted. Some of these men were in the Reserve Corps and were placed on active duty by the Army, others served as civilian interpreters on a per diem arrangement. Usually, there have been one or more men serving both at the Army induction board and in our Central Chest Clinic. Also, several men previously connected with our services, and therefore conversant with our routine, have served as civilian interpreters for the Army. Our bureau has also assisted the Army in selecting many of its civilian interpreters. Thus there has been an unusually close understanding between the physicians of the Army induction boards and our clinic as to methods, diagnostic standards, and purposes of the two services.

During the period when the entire service was provided by our department, financial assistance was secured as follows: The W.P.A. project in case-finding being directed by the Department of Health was diverted to this purpose. The Queensboro Tuberculosis and Health Association paid for the x-ray service for the Borough of Queens, and provided some funds to pay for the additional time worked by some clinicians beyond our budgetary allowances. The Bronx Committee of the New York Tuberculosis and Health Association also gave assistance in physicians' compensation beyond our budgetary limits.

#### EXAMINATION METHODS AT INDUCTION CENTERS

In order to include a chest x-ray as part of a complete examination in the Army induction station, the report on a film would have to be made within a few moments of its exposure. As each induction station was scheduled to handle from 300 to 500 men per day, it became

obvious that entirely new procedures would have to be devised. The roll-paper methods used in our routine surveys were not possible in this work. The equipment was, however, elaborated to permit a continuation of exposures at the rate of 120 per hour, using 14"x 17" paper films, which could be developed and made available for wet reading in an average of twenty minutes. Later there was employed at the induction station of Governors Island a battery of five 4"x 10" fluorographic x-ray units, each capable of covering 50 to 55 individuals per hour, or 100 to 110 exposure per hour as each individual has stereo pair. Each unit was capable of taking 14"x 17" celluloid films when desired.

It was clearly obvious that if men had to be completely examined and cleared by the Army within a matter of a few hours, it would be impossible in all instances to render a final and sound opinion on the pathology shown in their chest films. The majority of lesions would be well defined and no further study would be needed from the standpoint of the Army. A goodly number, however, would be of an equivocal nature demanding further study to determine etiology, activity, and acceptability. As the Department of Health was anxious to realize the maximum benefits from this service as a case-finding method, it was obvious that some plan should be devised to have all men with borderline or disqualifying x-ray pathology referred to us for further study. Thus, this mass survey could be made to render a real service to the Army and the community at the same time.

#### LESIONS REFERRED TO CHEST CLINIC

Thus, in the initial plans worked out with the Corps Area Surgeon and the Selective Service, it was proposed that men showing the foregoing types of x-ray lesions at time of examination should be referred to a Department of Health clinic for further study. The Central Chest Clinic of the Department, located at 125 Worth Street, and convenient to all transportation lines within the city by direct route or transfer, was designated as the point of examination. These plans also provided that reports from our clinic on each case examined be sent to the local draft board and the induction station. These reports would indicate whether the lesion noted at the Army examining station had been confirmed, thus definitely rejecting the man for future consideration, unless the maximum acceptable standards defined in M.R. 1-9 should be changed later. If the diagnosis was not confirmed, it would permit the reclassification of the man by his draft board as acceptable under the provisions of M.R. 1-9.

Once the Army rejected a man, it had no further supervision over him. He was, however, still under the control of his local draft board and could be called again for reclassification at their discretion. A simple referral slip was provided by the Army. This form gave the rejectee's name, address, local draft board number, and his x-ray diagnosis by code. It also indicated that he was to report within two to four days to our clinic. The Army further strengthened the effect of this gesture by seeing to it that this slip was given to the rejected man upon conclusion of his examination.

It is quite likely that the men receiving these referral slips accepted them as an Army order to appear, as approximately 75 per cent reported promptly to the clinic, although the fact that previously unsuspected pulmonary pathology was found must have been an additional urge to find out what it was all about.

Of the 25 per cent not reporting within two weeks, the clinic sent a reminder by postal card, which was sufficient to bring in the majority. When this failed, a report was sent to the local draft board, which wrote the man a letter requesting him to report to our clinic for examination. Through these three steps we have been able to secure examinations of about 94 per cent of all New York City men rejected in whole or in part on the basis of x-ray pathology as noted at the Army center. We receive daily from the Army a list of all New York City rejectees in which chest x-ray pathology is involved and are thus able to check off the men as they appear.

All films have not been sent to the Department of Health because M.R. 1-9 requires the distribution of such films to the state directors of Selective Service. Accordingly, in obvious cases, no duplicate film was available to send to the Department of Health, but in borderline cases, a 14"x 17" film was always taken in an effort to establish the diagnosis and acceptability; in such cases, the large film was forwarded to the Department of Health.

#### PROCEDURE AT THE CHEST CLINIC

When the man is admitted to our clinic, he is given a complete chest examination, including history, physical, fluoroscopy, chest x-ray, sputum by concentrate method, and any other examination indicated and possible on an ambulatory basis necessary to arrive at a final diagnosis. At the time of this examination the man is instructed to return in seven days for final advice. At this later date he is interviewed by a physician who explains his condition and its significance. A conference nurse also amplifies this advice and endeavors to get him started on the road to proper supervision. Thus, by the time the individual leaves the Central Chest Clinic, we have endeavored to educate him as to the importance of his x-ray findings and what he should do about them.

At the time of admission to the clinic, a search is made in a master roster of cases gathered in previous surveys and kept at the Central Chest Clinic. Not infrequently we find a previous record and series of x-rays that is of the greatest assistance in evaluating the man's condition at this time. If a definite lesion is noted in the Army film, a search is made in the master case roster of the Department, which contains over 60,000 names of previously registered cases. About 20,000 of these cases are under some form of active supervision, and the remainder are known to be arrested. This check also reveals previously known cases and provides valuable records for comparison with current films.

In a small percentage of cases we find open bacillary lesions in need of prompt hospitalization, and in many such instances the cases go directly from the clinic to the hospital as emergency patients. The majority of those showing reinfection forms of tuberculosis, how-

ever, are not urgently in need of care. In about two-thirds of this group the lesions have all the characteristics of arrest, while the remaining one-third are classified as clinically significant and in need of further supervision. Our experience indicates that we are perhaps overly cautious regarding this latter group, as subsequent supervision has revealed about 50 per cent to be stable so far as x-ray appearance is concerned. We know no way of making a closer selection of these lesions, as they are usually completely negative to physical examination, constitutional symptoms, or known exposure to the disease.

It is the purpose of the examinations in the Central Chest Clinic to arrive at a definite diagnosis. Any subsequent supervision becomes the problem of the man's physician or the district clinic. If the man indicates he has a physician, a report is made to him, providing he requests it. Our records and x-rays are not loaned to the physician but he may review them at the clinic. Further supervision of the case is entrusted to the physician if he is willing to assume the responsibility under our Sanitary Code, just as in any other case.

If the man has no physician, he is referred to the clinic serving the district in which he lives, and all records and x-rays are transferred to that clinic. Regardless of whether the need is for prompt supervision or a periodic examination a month or so hence, the man is urged to call at the clinic within a few days so that he may become acquainted with the physician and nurse and they with him. The district clinic then places the case under the indicated supervision and, if there are contacts to be examined, the routine procedures are followed, just as if the case had originally been found at the clinic. The majority of men examined as rejectees later become district clinic cases. It is obvious, therefore, that all men rejected and examined by us have been offered adequate facilities for supervision of their condition, as well as their contacts. The majority cooperate readily; some, as would be expected, become delinquent.

#### REPORTS TO THE ARMY

As previously indicated, reports of our final classification are sent to the induction station and the local draft board through the Office of the Medical Director of Selective Service. These reports may indicate a confirmation of the Army findings, or they may indicate that a lesion apparent at the time of the Army examination has since cleared, as in the case of a resolved pneumonia; or the lesion found originally may now be considered as acceptable under the limits prescribed in M.R. 1-9. The number of cases falling in this latter category average about 8 per cent. Such reclassifications are inevitable because of the speed with which men must be cleared by the Army, and the fact that a single x-ray frequently is insufficient evidence to arrive at a final conclusion. It has been our policy never to recommend a man with a lesion as eligible for Army service unless we feel reasonably sure of its etiology or stability. It is our opinion that many of the lesions which are of a disputed character or appear to exceed the limits prescribed by M.R. 1-9, and therefore cause the individual to be rejected on the

basis of a single examination, will later be found to be stable and acceptable without undue risk.

When our examination of a rejectee indicates that a change should be made in the classification based upon the original examination made by the Army, we send our report to the local board and the Army examination station, and also provide for our records and series of x-rays to be sent, if desired, so that these authorities may review our evidence. They make a notation of these findings on their records so that when the man returns for examination the records will carry the complete medical history. In the majority of instances there is agreement between the two staffs on the reclassification, though occasionally the Army decides that its best interests will be served if the man is permanently rejected. In any event, it is the responsibility of the Army to determine eligibility, and our service merely endeavors to assist in accumulating as much medical information as is possible on a given problem case.

#### ASSISTANCE TO REJECTEES

In the majority of instances, the discovery of a lesion by x-ray is the first evidence the man has that his chest is not normal. It is a matter of considerable concern to him and not infrequently mitigates against his returning to his old job. Fortunately, most of the lesions found are of minimal extent and arrested, and while they may be just cause for rejection for military service, they should have no effect on ordinary activities. Thus men with healed primaries, or with well-healed reinfection forms of the disease, are promptly discharged from further supervision and requested to report back only in the event of intercurrent respiratory symptoms. The problem created in relation to their jobs is a serious one, and the action of many employers in refusing to re-employ the man is unwarranted. In many instances, we have been able to assist the men in re-employment, but there is need for more health education on this subject. This could well be a special project for the tuberculosis and health associations, whose chief function is the dissemination of sound health education to the public.

The Bureau of Tuberculosis has established another vitally important service in cooperation with the Corps Area Surgeon. Not infrequently an individual formerly found at our clinic is inducted into the service without any apparent knowledge of his previous condition. Usually these men have not cleared through the local physical examination centers as selectees; they may have enlisted locally before all such men were x-rayed, on the basis of a physical examination; others have enlisted in other centers, and either purposely or through neglect have failed to divulge their past medical records at the time of examination. On the other hand, a few men with previous bacillary lesions now have only a minimal productive process, the volume of which is within the limits prescribed by M.R. 1-9.

Whenever such a case comes to our attention, usually through the district nurses, a complete report is submitted to the Corps Area Surgeon. He then endeavors to locate the man in the service and secure a current report from the local medical authority. On request from

the local authority we loan our x-rays or other data to assist in the appraisal of the case. As a result, some of these men are mustered out of the service; others who appear to be good risks are retained. In any event, the Army's record of the man carries the full tuberculosis record so far as the known facts are concerned.

#### INCREASE IN NUMBER OF EXAMINATIONS

The volume of work done by the Department of Health in the first nine months of 1942 increased over 100% as compared with the entire year of 1941. It is to be pointed out that the cases rejected because of pulmonary pathology include all forms of pulmonary and pleural changes as well as lesions obviously of a tuberculous character. This large increase is due to a great extent to the fact that the procedure of induction examination was changed subsequent to January 1, 1942. Prior to that date, each selective service registrant underwent a careful, complete examination by his local board, and a great many cases of chest pathology were thus identified and rejected without being referred to the Army. Since that time, the examination given by the local board has been cursory and is responsible for the fact that the percentage of cases rejected by the Army examining stations has doubled. Thus, the number of pulmonary rejectees referred to the Department of Health in the first nine months of 1942 was about four times as great as the number referred in all of 1941. Figures on the exact ratio of pulmonary tuberculosis and other forms of pulmonary pathology are not available at this time.

Other causes for the increase in the number of rejections for pulmonary causes in 1942 may be stated as follows: The registrants examined in 1942 were of an older average age group—in which we expect to find more tuberculosis and other pulmonary pathology. Also with the increase in the number of individuals being examined, physicians were assigned to induction examining teams without being sufficiently familiar with the interpretation of 4"x 10" stereoscopic films; they therefore leaned over backwards in disqualifying registrants who presented defects of little or no significance. This condition is becoming less of a problem as the roentgenologic interpreters gain experience with the newer methods. Contrary to common belief, there is nothing to indicate that the amount of pulmonary tuberculosis disclosed by examination of selective service registrants in the City of New York indicates an increased prevalence of tuberculosis in the community, as the induction station is now examining many cases previously known to the Department of Health.

Now that the number of men needed for the Army has been decided upon, it is obvious that in New York City we may expect no reduction in the numbers examined by the Army for some months to come. However, as many of the selectees to be examined will be in the 18 to 20-year-old group, it is to be expected that the percentage of rejected men will be lower.

The Army has recently transferred its induction station from Governors Island to Grand Central Palace in New York City. This station provides facilities for con-

ducting physical examinations of Selective Service registrants by ten individual teams, each geared to accomplish 200 physical examinations in an eight-hour day. The x-ray units now in use produce 4"x 10" stereoscopic celluloid film, with additional facilities for producing 14"x 17" films when indicated, of the chest or for other diagnostic purposes.

Thus far the Department of Health has not cooperated with the Navy in such examinations, as its recruits are usually x-rayed at the naval stations. We have, however, provided the same reports as to the Army on men known to have previous histories of tuberculosis.

We have also examined many men applying for commissions in the Army who have been rejected on the basis of chest pathology. In some instances, we have been able to get together additional information for the consideration of the Army.

#### SUMMARY

The Department of Health in New York City, from the outset of the draft in October, 1940, has worked in close relationship with the Army and Selective Service in providing through our facilities a complete chest examination service for rejectees.

This program has been of value to the Army and Selective Service in that more complete examination, usually requiring a protracted period, has recertified about 8 per cent of the rejectees as satisfactory for military service under M.R. 1-9. From the viewpoint of the Department of Health, it has provided a mass survey of numbers far beyond our ability to provide, and therefore has been a potent instrument in getting cases of tuberculosis under proper supervision.

The generous and understanding cooperation of the Corps Area Surgeon and the Medical Director of Selective Service has made it possible to set up and operate a far-reaching service with the maximum efficiency and at a minimum of expense.

As all rejectees are referred directly from the Army physical examination center to our chest clinic, it has been possible to complete their examinations within a few weeks after the lesion is found. There has been excellent cooperation on the part of the rejectees, for 75 per cent report on the basis of a recommendation by the Army. Of the remaining number, a reminder either from us or their local draft board has made it possible to examine approximately 94 per cent of those rejected.

## Tuberculosis on a Typical College Campus

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**A**T Carleton College, Northfield, Minnesota, a tuberculosis case-finding program has been in progress for several years. Since the autumn of 1936, when the writer assumed charge, this has included the annual tuberculin testing of every student and of all food-handlers and other employees coming into intimate contact with students. Individuals reacting to the Mantoux test have been x-rayed at once and annually or oftener thereafter while on the campus, with appropriate physical examination, clinical and laboratory studies provided for those whose findings indicated need for detailed follow-up.

The eleven annual reports of the Tuberculosis Committee of the American Student Health Association have traced the phenomenal development of tuberculosis control in our colleges and universities. The results have emphasized the success possible in the search for pre-clinical tuberculosis whenever and wherever modern methods are employed.

In a recently published five-year survey of the accomplishments in the college field, it was brought out that seven times as many cases were discovered in those schools with early diagnosis programs as in colleges where diagnoses are based on the final development of definite symptoms.

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It is the purpose of this communication to discuss the experience on a campus where the recommendations of the Tuberculosis Committee have been followed for seven consecutive school years, and to report on the encouraging results obtained. Carleton being a typical mid-western liberal arts college, our data represent a reliable cross-section of young American adults of college age and the tuberculous infection among them.

#### EXAMINATION ROUTINE

The enrollment at Carleton has ranged from 792 to 898 during the seven years of our program, averaging 853 per term, and divided almost evenly between the sexes. Each student is examined completely upon entrance, and in addition receives a careful check-up each year through the Health Service. Early in October the whole student body and the employees mentioned above are tuberculin-tested. We use mostly the purified protein derivative of tuberculin, administering an initial dose of 0.00002 mg. If, after 48 to 72 hours, this gives a negative reading, the second dose of 0.005 mg. is given, to be read after a similar interval. A smaller number of students were tested with Saranac Lake old tuberculin, employing a first-strength dose of 0.1 mg. and a second-strength dose, where necessary, of 1 mg.

In our experience, a single small dose fails to discover a considerable number of truly positive reactors, while a single large dose is apt to cause an undue number of

sore arms or constitutional reactions in highly allergic subjects. Admittedly more bother to all concerned, as well as costing more, the two-dose method still impresses us as safer and as clinically more accurate.

Positive reactors immediately receive a standard 14 x 17 chest roentgenogram, made at the Health Service and financed, like the entire program, from the medical fee included in the tuition charges. Films revealing suspicious findings call for stereoscopic studies, fluoroscopic viewing, and additional examination for possible physical signs. Other scrutiny includes sputum examinations, smear, culture, and guinea-pig inoculations of the fasting gastric sediment, three or more days of observation in bed at the infirmary, with five-minute temperature determinations and one-minute pulse counts recorded every two hours, and laboratory tests that embrace complete blood counts, erythrocyte sedimentation rates by Cutler's method, and a blood Wassermann.

Cases which, upon initial study or repeated follow-up, betray evidence of a pathologically progressive lesion are advised to withdraw from college and place themselves under the best possible care at once, looking toward an early arrest of the process and a return to full or reasonable function as rapidly as their own future welfare and the safety of their associates will permit.

In exceptional cases, where the evidence is entirely reassuring that tubercle bacilli are not being disseminated by the patient among his fellow students, and where the clinical picture, evaluated by college physicians in consultation with chest experts, promises satisfactory progress with less than complete rest, a student may be allowed to remain in college under very close surveillance, some type of collapse therapy perhaps being attempted, and always upon a sharply restricted schedule of academic work and a regimen of extra rest and release from physical education requirements; such students, of course, live in a single room.

#### TUBERCULIN RESULTS

Carleton students, coming predominantly from the central regions of the nation, show a somewhat smaller percentage of positive reactors than experience would predict for an eastern, southern, or southwestern institution. Along with the encouraging decline in the incidence of infection as revealed by a dwindling frequency of reaction to the Mantoux test throughout American collegiate communities, Carleton figures show that in the autumn of 1936 the positive reactors among our students numbered 3 out of every 10 tested, while in October, 1942, the ratio had dropped to 1 in 5. We have found that, relatively, the male positive reactors will slightly outnumber the females in that category—roughly 12 to 10.5—comparing similar age groups. (Later it will be shown that our diagnosis revealed 5 cases of active tuberculosis in men students as against 2 among student women.)

During a period of four years, from September, 1938, to June, 1941, a special statistical analysis was made, the results being summarized in Table I. It will be noted that in that time, 1,863 students were tested and followed. A downward shift in positivity from year to year is seen, and a regional selectivity is also apparent. The

lowest incidence of positive reactions occurred among students from Minnesota (19.8 per cent). Those coming to Carleton from other portions of the midwest showed a slightly higher percentage (23 per cent), those from more distant parts of the country a still higher one (27.9 per cent); while of students born and reared outside the United States, 3 out of 4 proved to be positive reactors.

When we classified the young people into those coming from communities of over 2,500 population and those from towns of less than that or from farming communities, we again encountered figures which indicate that the multiplied chances of exposure in the more densely crowded areas had resulted in a heightened incidence of infection. Urban dwellers averaged 29.2 per cent positive, rural students only 17.6 per cent reactive.

Similarly, checking the environmental factors against the tuberculin results, we noted that students with one or both parents of foreign origin were more apt to be positive reactors than those whose parents were both born in this country—32.9 and 21.9 per cent respectively.

Viewed from a different angle, but with the same points in mind, we sifted our positive reactors to find that those coming from cities in excess of 2,500 population totalled 62.5 per cent of the group, while among our negative reactors, students from rural areas held the majority (53.6 per cent). Again, among the positive reactors, 81.2 per cent were of entirely American parentage, the percentage among negative reactors being 88.3 per cent. All of which substantiates the well-recognized fact that the more frequent or intimate the exposure to likely sources of infection, the greater the probability of infection.

It must be conceded we are assuming that in an urban center multiple exposures will be the lot of the individual, that in contact with the foreign-born they will be favored. But certainly all studies tend to indicate that the United States compares favorably with Europe and Asia in regard to tuberculosis infection and mortality rates, and that in general rural America contains infinitely less tuberculosis per 100,000 citizens than do our cities. Our present data seem to bear out these suppositions, even though our groups have not been large.

However, when we come to examine the answers received when we questioned students directly as to known actual exposure to tuberculosis, we discover that the average individual in an intelligent group remains blissfully ignorant of such contact.

Significant exposure, therefore, was reported by a remarkably small fraction of our student body, only 5.6 per cent. Nevertheless, we again observed that the knowledge of exposure was to some extent paralleled by the finding of a positive Mantoux, whereas a negative reaction was more apt to occur in those who recalled no exposure. The figures were as follows: Contact with a case of recognized tuberculosis definitely known to negative reactors, 1 in 33 individuals; to all students tested, 1 in 18; to positive reactors, 1 in 7. Even the last and best figure, however, blasts the idea that a history of contact is reliable, easy to secure, or would offer a suitable basis for the selection of persons requiring clinical observation.

### X-RAY RESULTS

During the period of detailed analysis, 1938 to 1942, 437 positive reactors were given chest x-rays. Of this number, as shown in Table II, 279 were interpreted as revealing no macroscopically detectable evidence of lesion. These "negative" films represented 63.8 per cent of those examined. The findings in the remaining 158 cases were regarded as indicative of various radiological evidences of pulmonary tuberculosis, viewed in the light of accepted criteria. Doubtful cases were fluoroscoped to determine whether shadows appearing on the films were due to calcified deposits, pleural granularities, and the like. Our final tabulation revealed we had read the films as follows: Roentgenograms thought to show the presence of calcium in the lungs, 123, or 28.1 per cent of all students x-rayed, these being further broken down into 64 individuals with characteristic Ghon's tubercles in the parenchyma and 59 whose visible organized deposits seemed confined to the hilar areas; films thought to reveal purely pleural changes, such as apical caps, localized haze, diaphragmatic irregularities, or obliteration of the normal sulcus, 32 cases, or 7.3 per cent of those filmed; and, finally, those interpreted as compatible with a diagnosis of reinfection tuberculosis in a progressive form, 3 cases, or 0.7 per cent of the entire positive reactor group.

The vast majority of these individuals having remained in college, so that there are anywhere from two annual films to several such studies in the series, we have had opportunity to check on and compare our findings from year to year; we have seldom had to revise previous opinions. If the limitations of radiological appraisal of intrathoracic pathology are kept constantly in mind, it will be apparent that these figures are, at their best, well in keeping with those reported by several other investigators; at their worst, they are probably more reliable than those of studies based solely on x-rays without benefit of prior tuberculin screening. From the experience of other observers, too, we feel that our findings, based on 14 x 17 films, are somewhat more accurate than if small pictures of the fluoroscopic image had been employed, with larger films used only in suspicious cases.

### CLINICAL RESULTS

Leaving the special four-year study and returning to a consideration of what the seven-year period of search has actually accomplished in finding early cases of tuberculosis, we are able to report having discovered no less than 7 student cases in a progressive phase of the disease, as well as one young food-handler who, undiagnosed, might have secured employment through which she could have passed her disease on to additional students and fellow workers. This average of 1 case per school year impresses us as ample justification for the program, if not actually sufficient reason for the college's maintaining on its campus a Health Service only one of whose duties is the ferreting out of unsuspected tuberculosis.

In Table III will be found the essential data concerning these 8 cases, so that a separate case history for each is unnecessary. Attention should be directed to the following points:

1. Only 1 of these individuals knew definitely of close contact with "open" tuberculosis. This was the food-handler, and her exposure had occurred eleven years earlier, when her mother had died of tuberculosis. Most of the intervening years had elapsed without medical follow-up, and she had had no x-ray for at least five years. Case No. 2 had worked in a hospital laboratory the summer preceding the October when his Mantoux was first found positive (it had been negative the preceding February). Opportunity for exposure was not lacking in this instance, nor in Case No. 7, a student of American parentage, born and reared in Japan, though the specific contact remained undetermined in both cases. Another boy, Case No. 6, had had occasional contact with a cousin supposedly suffering only from bone tuberculosis. The remaining cases were unable to relate their infection to known exposure.

2. As regards previous history, 4 cases could provide no significant clues; 2 had had previous attacks of pleurisy, one on two occasions, but neither patient had received the benefit of a chest x-ray. One boy, Case No. 5, had a known lesion of minimal extent, under observation at home and under control when admitted to college. We did not discover his lesion, therefore, but did ascertain its reactivation and spread. Another case had been informed that he had "healed childhood tuberculosis," but this was not mentioned on the matriculation medical blank submitted by the family physician, so that the process was found only when we x-rayed his lungs on the basis of his former positive tuberculin reaction.

3. Symptoms, when present at all, were slight in every case. Three patients were symptomless. Two others admitted slight but definite and unusual fatigue; two related their cough, chest discomfort, and general malaise to recent upper respiratory infections. The observation case that broke down and developed cavitation and a systemic reaction during our period of close follow-up thought that his illness had been two rapidly successive attacks of influenza, one at home during the Christmas recess, one in January at college, during which latter illness we determined the true explanation of his toxemia.

4. Two patients came to us with a history of a previously positive Mantoux test; 1 of the others kept her former positive reaction concealed, turning up with a 1+ during our testing; of the remaining 5 cases, 2 were 1+, 1 was 2+ and 1 was 3+ to the first dilution, while 1 showed a 2+ reaction upon receiving the second-strength dose. Dismissal as a supposedly negative reactor following the initial dose would have led to this case being overlooked. In no instance in the past seven years have we encountered a 4+ reaction to tuberculin.

It was possible to record minimal physical findings upon careful examination of the chests of 6 of these 8 people, though in at least 4 it must be emphasized that two competent examiners confess to the fact that the extremely scanty aberrations from normal would have been missed had it not been for directive roentgenological clues. Usually the physical findings consisted of no more than barely noticeable lag or restriction of expansion of the affected apex, occasionally a minor impairment of percussion note, in 2 instances a definite increase in vibra-

TABLE I  
Analysis of Four-Year Study of Tuberculin Testing.  
Carleton College, 1938-1942

	Men	Women	Total	
Students Mantoux-tested	928	1035	1863	
Positive reactors	231	206	437	
Positives by years	College Year	Number Tested	Per Cent Positive	
1938-39	671	26	5	
1939-40	319 new + old neg	24	6	
1940-41	320 new + old neg	22	6	
1941-42	344 new + old neg	22	2	
Origin of students	Region	Number Tested	Per Cent Positive	
Minnesota	769	19	8	
Other midwest states	858	23	0	
Remainder of U.S.	147	27	9	
Foreign	49	73	5	
Homes of students	Cities over 2,500	934	29	2
	Suburban or rural areas	929	17	6
Family background	One or both parents foreign-born	249	32	9
	Both parents American-born	1,614	21	4
	Cities over 2,500	Suburban or Rural		
Derivation:	Positive reactors	62 3%	37 5%	
	Negative reactors	46 4%	63 6%	
	Both American-born	One or Both Foreign-born		
Parentage:	Positive reactors	81 2%	18 8%	
	Negative reactors	88 3%	11 7%	
	D=Definitely Known to Student			
History of contact:	Among all tested	5 6%		
	Among all negative reactors	3 2%		
	Among all positive reactors	13 7%		

tory phenomena. Unequivocal fine rales after cough were heard in but 3 patients. One of these latter cases also presented a transient friction rub over the involved hilat region. Four cases had no fever; 4 had a daily rise in temperature, none going above 99.8°F. Pulse and respiration rates were virtually unaffected.

5. Laboratory findings included the following: Only 1 case could produce sputum, and this was negative for tubercle bacilli. All the student cases were checked by gastric lavage of the fasting stomach contents. In 2 cases this showed the presence of acid-fast bacilli upon immediate smear, in the remainder not. Guinea-pig inoculation was done in 6 instances, with negative results in 2. definite tubercle development in 2, death of the animal from intercurrent infection in 1, and 1 still incomplete. This portion of the investigation was done for us by the

TABLE II  
Four-Year Study of Roentgenograms of Positive Tuberculosis Reactors, 1938-1942

Number	Per Cent	Interpretation of Films—Predominant Features				
		Positive Reactors X-rayed	No Evidence of Pulmonary Tuberculosis	Calified Deposits		Progressive Changes Only
				Ghon's Primary Tubercle	Hilat Nodes Only	
437	100	64	59			
279	63 8	123	32			

TABLE III  
Data in 8 Cases\* of Progressive Reinfection-Type Tuberculosis, 1938-1942

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8
Sex	F	M	M	F	M	M	M	F
Age	20	20	18	18	19	18	18	19
Class	Sen.	Jun.	Pop.	Fresh.	Fresh	Fresh	Soph.	Employee
Date	1940	1938	1934	1939	1940	1941	1942	1942
Contact known	No	Hospital lab (?)	Nn	Nn	No	Cough bone TB	Nn	Mother died of TB
Past medical history	Pleurisy twice	Pleurisy once	Clear	Clear	Lesson known	'Healed Ch TB'	Clear	Clear
Symptoms present	Easy fatigue	Slight fatigue	Pain, cough, fatigue	Cough from "cold"	Recent "flu" fatigue	None	None	None
Mantoux results	3+ (1st)	1+ (1st)	1+ (1st)	2+ (2nd)	Prev. pos.	Prev pos	2+ (1st)	1+ (1st)
Physical findings:	No	No	No	No	Definite	No	No	Suspected
Found prior to x-ray	Definite	With difficulty	Gradually	No	Definite	No	With difficulty	Definite
Recognizable after x-ray								
Laboratory findings	None	None	None	Neg	None	None	None	None
Sputum	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg
Gastric lavage smear	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg
Guinea-pig inoc.	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg
Se-ro test (1st)	21 mm.	Normal	Normal	12 mm.	70°	90°	85°	85°
Hemo (Sahli)	68%	80%	80%	49%	43%	49%	44%	43%
RBC (million)	2.9	4.5	4.9	4.3	4.9	4.6	4.4	4.3
WBC (thousand)	8.0	6.8	6.3	12.1	9.8	8.5	6.4	7.9
Plm.	62%	68%	52%	55%	70%	75%	70%	75%
Lymph	13%	12%	47%	43%	29%	27%	27%	23%
Miscel.			1%	1%	1%	1%	3%	2%
Wass. & Kahn				All negative	All no film			
Urinalysis								
X-ray findings	Left 1stIS	Left 1st & 2ndIS	Left 2ndIS	Pl. Cerv.	Pl. Cerv.	Pl. Cerv.	Pl. Cerv.	Left 1stIS
	Later, Cerv'tn	Cerv'tn Calc.	Ghon Hilum	Left 1stIS	Left 1stIS	Left 1stIS	Left 1stIS	Cerv'tn Calc.
	Cerv'tn Calc.	Hilum	Hilum	Cerv'tn Calc.	Cerv'tn Calc.	Cerv'tn Calc.	Cerv'tn Calc.	Hilum

\*A ninth case, a foreign student with tuberculous synovitis of the knee, is not included.

Minnesota State Department of Health, Division of Preventable Diseases. The hematological findings are given in Table III and show mild secondary anemia in a few instances, a favorable leukocyte response in all cases, and usually an erythrocyte sedimentation rate that provided little useful information, being normal or very slightly increased.

6. The roentgenographic findings revealed a minimal infiltration in all but 1 case at the initial filming. This case, No. 8, the food-handler, had a bilateral process of moderately advanced proportions. One boy, Case No. 5, had a bilateral involvement, predominantly confined to his left apex. This individual and a girl, Case No. 1, developed cavitation while under observation; the employee presented it when first examined. A curious coincidence is provided by the location of the lesion in the left upper lobe in every one of the 8 cases, with some further involvement of the right upper lobe in 2 of them.

7. All 8 patients have made or are in process of making satisfactory progress. Case No. 1, being a senior, was allowed to finish her course, meanwhile remaining under the constant scrutiny of a noted specialist in chest diseases. In spite of a reduced schedule of studies and what appeared adequate rest, this individual soon showed central excavation in her lesion. This responded favorably to pneumothorax therapy, and the girl completed work for her A.B. degree. The following year, however, demonstrating that her lesion was still capable of causing trouble, an abdominal operation at Rochester, Minnesota, revealed the presence of spread in the form of an acute tuberculous peritonitis. This cleared up, and the patient is now in excellent health, married, and in no way disabled.

Case No. 2 withdrew from college promptly, entered a Minnesota sanatorium, and was soon placed on pneumothorax treatment which was continued for eight months. He returned to college the succeeding year, graduated, entered medical school, and now holds his M.D. degree. Frequent check-ups have shown his lungs to be in good condition.

Case No. 3 could not be induced to consider sanatorium training and care, but rested in bed at home for seven months. He then resumed his studies and is at present in medical school, free from further chest trouble, as proved by frequent re-examinations.

Case No. 4 immediately entered an Iowa sanatorium, remaining there for about one year. She is now a student at a state university and is in good health, as proved by x-ray every three to four months.

Case No. 5 left school to enter a Minnesota sanatorium, was subjected to a successful pneumothorax regimen, and is now enrolled in another college, his health being reported as good but his activities still somewhat limited.

Case No. 6 followed the same course as Case No. 5, remained in another Minnesota sanatorium not quite a year, is still receiving refills periodically, and is attending a state college part-time.

Case No. 7 has barely begun his treatment in a Massachusetts sanatorium at the time this report is being completed.

Case No. 8 is now in her sixth month of care at a Minnesota tuberculosis hospital and doing very well.

#### COMMENT

In the opinion of the writer the early diagnosis of pulmonary tuberculosis is neither difficult nor costly. In a college or university, made up of undergraduates between the ages of 17 and 23 and graduate students a few years older, failure to make a determined and repeated search for tuberculosis is inexcusable, for this disease is known to be the chief cause of death in this age group.

Where modern methods are followed, gratifying results will be obtained. Every preclinical case of tuberculosis turned up will be to the credit of the institution, to the salvation of the victim, and to the benefit of those who otherwise would be needlessly exposed to infection. The advantages of treating early rather than late cases of tuberculosis are so well recognized today that they need no elaboration. It is enough to emphasize the shorter term of treatment, the more favorable prognosis as to ultimate cure and lasting function, the minimizing of suffering and of spread, the saving of family and taxpayer from multiplied expense.

In anticipation of possible queries whether these early cases might not have healed without any treatment, it should be noted that Cases No. 1, 3, 5, 6, 7, and 8 in this series are known to be examples of breakdown from previously demonstrable lesions, while Cases No. 2 and 4 may well also be, save that the traces of their first infection seem to have been too microscopic or too obscurely situated to cast shadows on a roentgenogram. In view of this circumstance, it seems fair to assume that the predictable course of these 8 cases would have been unfavorable and not benign had nobody succeeded in finding them when they were found, or had their reactivation not been picked up by a system of frequent rechecks.

It is felt that Carleton College, through its tuberculosis case-finding effort, has contributed signalily and intelligently to the public health, the public economy, and the public education, and that any college, industry, or other unit can achieve comparable success by adopting and enforcing similar safeguards.

#### SUMMARY

Seven years of tuberculosis case-finding at Carleton College between 1936 and 1942 are summarized and discussed.

The routine for examining students and employees is outlined; tuberculin-testing results and x-ray findings are analyzed.

History of contact with tuberculosis is revealed as inaccurate and unreliable in a search for new cases.

Ordinary methods of physical examination, short of chest x-ray, are shown to be insufficient to diagnose the majority of cases of preclinical tuberculosis.

The findings and the satisfactory courses of 8 cases of progressive reinfection-type tuberculosis discovered by the program are presented.

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# An Analysis of 149 Tuberculosis Deaths During 1940-41

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**T**UBERCULOSIS deaths are to be expected as a normal sequence of tuberculosis disease. Yet, paradoxical as it may seem, it has been our observation that deaths due to tuberculosis are usually incidental or accidental. Tuberculosis, except in certain forms of the invasion of the tubercle bacillus such as miliary, meningitis, and bilateral renal infection, is in itself not usually a killing disease.

An analysis of our group of cases ending in death would indicate that there is much left to be done in order to postpone if not to alleviate the conditions leading up to death in these patients. Both the chronicity of tuberculosis and its tendency to fibrose, calcify, and reactivate are common among those who have eventually died of this cause. Yet it would appear that the presence of the tubercle bacillus and its tissue reactions are often no more than a paralleling coincidence to the determining cause of death. Had therapeutic procedures been applied when indicated much good might have been accomplished. It is evident from the study of our cases that the prognosis becomes more serious with the delay in beginning treatment. Many of our patients who could not be benefited by the application of known therapeutic measures were those who, following a long prodromal period without recognition, finally were found with extensive pathology. The remaining group with few exceptions constitute a residue of therapeutic and surgical failures which, if treated at an earlier date, would have yielded more satisfactory results.

There were 149 fatalities at the Minnesota State Sanatorium during 1940-41 out of a total of 926 patients cared for in the hospital; of this group 113 were admitted to sanatorium care for the first time, while 36 gave histories of previous admissions. The fatalities can be divided into four groups:

1. Tuberculosis deaths due primarily to pulmonary tuberculosis, 57 cases.
2. Pulmonary tuberculosis in which death was chiefly due to nonpulmonary tuberculosis, 57 cases.
3. Nontuberculous cause of death in patients with chronic tuberculosis, 26 cases.
4. Tuberculosis deaths secondary to childbirth, 9 cases.

There were four deaths in the hospital that are not included in this study. These patients were admitted but a short time before death and were found to be nontuberculous.

Quite generally, regardless of the grouping, there is a history of a variable prodromal period. The patient is frequently conscious of this change in his sense of well-being for a period of weeks or months before presenting himself to his physician. At times, too, the prodromals may be so obscure that the physician is not able to arrive at a satisfactory diagnosis except through the

aid of the skin reaction to tuberculin and the chest roentgenogram.

In our experience the earlier in the prodromal period that clinical investigation is made, the earlier the diagnosis is arrived at and treatment begun. It would seem from our observations that this so-called prodromal period does not constitute a true prodromal period but rather a preclinical phase of tuberculosis, and that active clinical tuberculosis disease as such begins much earlier than has been thought. The "prodromal period" must extend much farther back in the case history to cover the period from establishment of allergy to the beginning of signs now identified as prodromal.

A satisfactory history of a prodromal period was obtained in 70 of our cases. The data would indicate that many of our patients had actually been carrying on their usual family, social, and industrial responsibilities while suffering with active tuberculosis for months or intermittently for years, a period which we must now identify as prodromal.

## GROUP I

This group includes 57 cases in which progressive pulmonary tuberculosis was the cause of death. Fifty-six of these were admitted as Stage III cases, 52 of them showing evidence of cavitation. Six were preterminal at the time of admission. Collapse therapy was attempted in 33 cases, and was to some degree successful in 14; while in 24 no attempt at collapse therapy was made. Deaths occurring in this group must be credited to pulmonary tuberculosis because of the advanced stage of the disease on admission. Much might have been done to convert a case with a questionable prognosis into a cure if therapy had been given when indicated.

TABLE I  
Duration of Prodromal in 32 Cases of the 56 Admitted as Stage III

Age	Duration of Prodromal
15-19	2 mo., 3 mo., 8 mo.
20-24	3 wk.
25-29	1 mo.
30-34	4 mo., 6 mo., 1 yr.
35-39	2 mo., 4 mo., 6 mo., 1 yr., 2 yr., 2 yr., 4 yr.
40-49	4 mo., 1 yr., 2 yr., 4 yr., 10 yr.
50-59	3 mo., 1 yr., 1 yr., 4 yr., 3 yr., 8 yr., 10 yr.
60-69	10 mo., 1 yr., 2 yr.
70 and over	1 yr.

The prodromal period seems to be somewhat longer in the older age groups (see Table I). To a large extent this can be explained by the closer check-up among younger people. Eight months is the longest reported prodromal period up to the age of 29; from this time on the period lengthens, so that among the older patients prodromals are often recalled in terms of years rather than months.

The number of cases showing a long period of symptoms leading up to the final diagnosis partially explains the increase in tuberculosis deaths among the aged. This no doubt is because we are looking for the disease in the aged more often than we formerly did, rather than be-

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cause tuberculosis is now attacking this age group oftener than in former years. The fact that in the past this age group frequently concealed carriers who exposed and infected younger members of the family gave credence for generations to the idea that consumption was an hereditary disease.

The prodromal period at one time extended up to the consumptive state; now we frequently observe it extending into the clinical course of the disease to the point of cavity formation.

#### GROUP II

In our study there were 57 deaths actually caused by tuberculosis involving parts of the body other than the lungs. Of these 25 gave a history of a prodromal period prior to breakdown. Thirteen of these were under 35 years of age, while 12 were 50 years or over (see Table II).

TABLE II

Deaths Due to Tuberculosis Disease Other Than of the Lungs	Duration of Prodromal
Age	
15-19.....	2 mo., 5 mo., 6 mo., 6 mo., 10 mo.
20-25.....	1 mo., 2 mo., 8 mo., 5 yr.
30-34.....	1 yr., 3 yr., 2 mo., 1 yr.
50-59.....	6 mo., 1 yr., 2 yr., 1 yr., 1 yr., 2 yr.
60-80.....	1 mo., 6 mo., 3 yr., 1 yr., 1 yr., 5 yr.

These pulmonary and nonpulmonary forms of tuberculosis were advanced when first presenting themselves for treatment. There were 40 cases classed as Stage III, 36 of whom showed evidence of cavity formation when admitted. Some form of collapse therapy was attempted in 24 of these cases. Twenty-seven suffered from laryngitis or enteritis. These complications presented many difficult problems of treatment, coming as they did late in the course of the disease.

#### GROUP III

This group includes those who were ill with pulmonary tuberculosis but who died from a nontuberculous disease. There were 26 deaths falling in this classification, 23 of whom were in Stage III on admission. Seventeen showed evidence of cavity formation when admitted. Collapse therapy was attempted in 13 of these cases, 4 of whom recovered following thoracoplasty and suffered cardiac deaths. These cases, too, had progressed beyond the point where therapy might hold out promise of permanent relief.

Three patients had had previous sanatorium care with later reactivation. One patient had been hospitalized since 1918. He had succeeded in gaining a negative sputum status which he maintained for two years prior to death. The second patient with reactivation tuberculosis left the sanatorium in 1932 and was employed steadily until readmitted with pneumomycosis. The third patient who reactivated left the sanatorium in July, 1936, and was readmitted in August, 1939. Prodromal periods in the cases of Group III were usually longer than in Groups I and II.

TABLE III

Nontuberculous Cause of Death in Cases with Chronic Tuberculosis	Duration of Prodromal
Age	
30-34.....	1 yr.
40-44.....	1 yr.
50-54.....	1 yr., 1 yr., 1 yr., 2 yr.
55-59.....	1 yr., 2 yr., 4 yr.
60-64.....	2 mo., 1 yr., 5 yr.
70-74.....	2 yr.

#### GROUP IV

Deaths in this group occurred among young mothers, aged 20 to 27, whose histories showed a close relationship between childbirth and tuberculosis. More careful history-taking during the prenatal period as well as at the time of confinement would have indicated the need for a Mantoux test and roentgenogram of the chest in each of these young mothers. In order that an early diagnosis can be made in these cases it is well to bear in mind that the more obvious symptoms are frequently the ones that, being overlooked, permit the disease to become too extensive for our present therapy to influence.

There were 9 deaths in young women 20 to 27 years of age in which the development of tuberculosis was closely associated with childbirth. Thus of the 17 deaths among young women of this age group in our series, over half of them associated their breakdown from tuberculosis with pregnancy and childbirth.

#### OTHER DATA

The 4 nontuberculosis deaths were all among patients who were very ill on admission and died soon after. The deaths were due to lung abscess, to perforation of an incarcerated bowel in diaphragmatic hernia, to carcinoma of the stomach, and to pneumonia.

The successful use of any therapeutic agent in the treatment of tuberculosis depends upon the stage in the development of the disease that diagnosis is made and treatment started. Deaths among the 113 patients admitted to the sanatorium for the first time showed the following conditions to be contributing factors:

Addison's disease .....	2	Empyema .....	1
Arteriosclerosis .....	2	Enteritis .....	.14
Cerebral hemorrhage .....	3	Laryngitis .....	7
Cardiorenal .....	5	Meningitis .....	5
Carcinoma .....	1	Miliary .....	1
Childbirth .....	9	Silicosis .....	1
Coronary disease .....	2	Spontaneous pneumothorax .....	4
Diabetes .....	4	Terminal on admission .....	12

Many of these cases when first admitted had already passed beyond help other than symptomatic or domiciliary care. We are still unable to apply adequate therapy at the time the disease is usually found.

The incidence of enteritis and laryngitis among our patients was an important factor in the number of fatal terminations. Of the 149 cases, enteritis developing before the patient passed into a terminal state was reported in 21, with laryngitis in 15, the two conditions being combined in 13. These complications all occurred in far-advanced cases of pulmonary disease. Frequently the laryngitis and less often the enteritis was the chief complaint, and remained the most distressing condition during the patient's illness. When both laryngitis and enteritis developed in the same patient it was usually late in the terminal stage. There was seldom cessation in severity of symptoms once the lesions became established.

#### CONCLUSIONS

- During much of the prodromal period the patient should be under treatment.
- By the time most patients present themselves for treatment, they have passed beyond the care of the clinician to that of the surgeon.
- Many deaths from tuberculosis might have been avoided if it had been possible to have the patient under control at the time treatment was indicated.

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The Official Journal of the  
North Dakota State Medical Ass'n  
North Dakota Society of Obstetrics  
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## DIAGNOSIS OF TUBERCULOSIS

The diagnosis of tuberculosis has passed through important evolutionary stages since the time of the ancient physicians. The examinations made by Hippocrates and those who followed for many centuries were limited largely to naked eye inspection. Certain symptoms and signs were observed, such as emaciation; hence the names *phthisis* and *consumption*. Thus, this disease was usually diagnosed after it had reached the terminal stage.

Auenbrugger in 1761 introduced immediate percussion but it was little used until 1809 when Corvisart (Napoleon's private physician) called attention to its value in diagnosis.

When Laennec invented the stethoscope in 1816 sounds from within the chest were first distinctly heard by the human ear. Laennec carefully described auscultatory signs and often had an opportunity to interpret them at the postmortem table. Thus, the stethoscope became a valuable instrument in diagnosing the presence of disease.

With the invention of the compound microscope by the Janssens in 1590 physicians were provided with a most valuable instrument. However, it furnished no aid in the diagnosis of tuberculosis in the living body until 1882, when Koch announced the discovery of the tubercle bacillus. This was the first time in the entire history of medicine that the physician had a reasonably accurate procedure in differential diagnosis. Many conditions then and now cause the human body to enter into a consumptive state. The symptoms are almost identical for several diseases of the lungs; no symptom is pathognomonic. This is also true of physical signs. The finding of tubercle bacilli was the only specific information that could be obtained with reference to tuberculosis. Koch's discovery was hailed with glowing enthusiasm because it was believed that in every case of tuberculosis the physician would be able to detect the presence of tubercle bacilli in the secretions or excretions. Time and experience dampened the ardor, however, when it was learned that tubercle bacilli do not appear in the sputum

of most patients until the disease is moderately or far advanced. Moreover, by the time they are found with the microscope, the disease is contagious and may have spread to others.

Further difficulty in microscopic interpretation arose when bacteriologists discovered numerous acid-fast saphrophytes which have the same appearance as tubercle bacilli under the microscope. Thus, animal inoculation became an important diagnostic procedure: First, to determine whether tubercle bacilli were present when the microscope did not reveal them in certain materials; second, whether acid-fast bacilli were pathogenic. When tuberculosis was suspected, and there was no expectoration, a number of methods was devised for producing sputum, such as gagging the patient and the administration of large doses of potassium iodide. Later the examination of gastric washings was found valuable.

The most important step of all time in diagnosis was taken in 1890 when Koch made tuberculin available. The tuberculin test is highly specific for tuberculosis. If an individual does not react to this test, the physician has the satisfaction of knowing that tubercle bacilli are not present unless they have entered within the past few weeks or the disease is in an extremely acute or terminal stage. On the other hand, when the individual reacts to tuberculin the physician knows that living tubercle bacilli are present in the body in lesions which may vary from microscopic to gross proportions. The tuberculin reaction indicates that the individual already has tuberculosis but whether clinical lesions are present or subsequently develop must be determined by other phases of examination.

When Roentgen presented his discovery of a new light ray in 1896, there was so much mystery associated with it that exaggerated predictions were made concerning its future value in diagnosis. This was also hailed with fervor, which was partially justified, as far as the detection of areas of disease in the lung were concerned, but the enthusiasm was restrained when it was realized that inspection of an x-ray film fails to reveal lesions below the range of vision of the unaided eye, that only 75 per cent of the lung is visualized on the ordinary x-ray film, that shadows of disease are not specific findings, and that extensive extrathoracic tuberculosis may be present while the chest appears clear. The etiological diagnosis of any disease can not be determined with certainty by the shadow it casts on the x-ray film.

The bronchoscope, introduced by Killian in 1898, has become an extremely important instrument in differential diagnosis. Through the bronchoscope, material may be obtained for microscopic inspection and, thus, tuberculosis and other diseases are frequently diagnosed accurately when all other phases of examination are of no avail.

Thus, the physician is limited to two medical findings that are specific; namely, the tuberculin reaction and the recovery of tubercle bacilli. In the absence of one or both of them, there is no reason to diagnose tuberculosis, regardless of symptoms, physical signs, and x-ray shadows. The medical profession has erred seriously in recent years by conducting surveys which are limited only to

the tuberculin test and x-ray film inspection of the chest. Indeed, these two procedures are only screens for the purpose of selecting those persons who are in need of adequate medical examination.

By complete examination, beginning with the tuberculin test, inspecting x-ray films of the chests of the reactors, and completely examining by clinical and laboratory procedures (as well as periodic x-ray film inspections) the physician can now diagnose nearly all chronic pulmonary tuberculous lesions long before they cause illness and usually before they are contagious. When found in this early stage, the majority of cases can be treated successfully and the disease is prevented from perpetuating itself.

J. A. M.

### TUBERCULOCHEMOTHERAPY

Modern chemotherapy dates from 1909, when Ehrlich's studies culminated in the epochal discovery of arsphenamine. The spectacular benefits issuing from Ehrlich's researches were responsible for the expectation that most, if not all, infectious diseases would quickly, or eventually, be brought under control or subdued by specific chemical agents. These hopes have remained far short of realization. An outstanding example of a disease that has remained stubbornly resistant to chemical agents is tuberculosis. Although innumerable drugs have been tried for experimental tuberculosis, by many investigators since the time of Koch, the results until recently have failed to supply sufficient promise to warrant enthusiasm for chemotherapy as a future weapon for combating the disease. With the advent of the more recent era of chemotherapy ushered in by prontosil in 1935, new impetus was furnished for renewal of the attack on this important problem.

The wide use and relative effectiveness of sulfonamide compounds, such as sulfanilamide, sulfapyridine, sulfathiazole and sulfadiazine, for certain acute infections justified trial of these agents for combating experimental tuberculosis. The results have been generally disappointing. While the experimental form of the disease can to some extent be influenced favorably by the sulfonamide compounds, none of these drugs is sufficiently efficacious to satisfy the exacting criteria demanded for a successful tuberculocchemotherapeutic agent. None of the known sulfonamide drugs actually will arrest the progress of experimental tuberculosis in guinea-pigs.

With another group of chemicals known as "sulfones," the results have been definitely more encouraging.<sup>1</sup> Experimental evidence now available indicates that several drugs having a diphenyl-sulfone nucleus are capable of strikingly favorable effects in tuberculosis of guinea-pigs. Most of the sulfones tried have been derivatives of 4,4'-diaminodiphenylsulfone. The parent compound has a high tuberculotherapeutic efficacy but its potential toxicity limits its clinical application. The data accumulated during the past three years reveal that tuberculosis in the highly susceptible guinea-pig can be successfully arrested by several drugs of the sulfone series. This has been demonstrated repeatedly, even when treatment has been delayed until six weeks after

the animals had been infected, and the drug has been administered daily thereafter by the oral route.

At present the problem of chemotherapy in experimental tuberculosis has been narrowed to a specific group of compounds that appear to offer the most likely possibilities of being satisfactory agents. It is not an overstatement to say that more encouraging results have been obtained in solution of this problem during the past five years than during the previous fifty. The prospect for future gain seems impressive.

Experimentalists have established evidence that the tubercle bacillus must be added to the growing list of organisms which are vulnerable to chemotherapeutic attack. However, it remains to be proved that tuberculosis of man can be added to the list of diseases which can be cured by chemotherapy. Experience with the acute streptococcal and pneumococcal diseases cannot be strictly applied to such a problem, except that in such diseases chemotherapy appears to arrest the multiplication of organisms and to permit natural defenses to correct the damage inflicted on the host. When treatment in these diseases is delayed long enough to permit extensive destruction of tissue, the response to chemical treatment is not likely to be spectacular. Early pneumonia is rapidly cured but late pneumonia may or may not be benefited; postpneumonic empyema or pulmonary abscesses are not likely to respond at all; although in all instances the infecting organism may be the same. If this analogy holds in the case of tuberculosis, much more definite response to treatment should be anticipated when lesions are in earlier rather than later stages of development. Present experience suggests that this may be true in fact.

The most convincing evidence for tuberculotherapy would be afforded if it were possible to cure clinical tuberculosis in some of its irreversible forms, such as tuberculous meningitis, miliary tuberculosis or terminal stages of pulmonary tuberculosis; yet it may be illogical to anticipate this result as to expect arsphenamine to cure neurosyphilis or sulfonamides to cure lung abscesses.

It will probably require great patience, rare judgment and long experience to define what role chemotherapy may play in the treatment of clinical tuberculosis. As progress continues an unprejudiced point of view should be maintained. Skepticism but not cynicism should be the attitude, with judgment based squarely on evidence. Until abundant and convincing evidence of safety and efficacy is available no drug should be released for commercial exploitation. In the meantime, Federal regulations restrict distribution of these drugs to a few research centers. The following statement by the late Dr. Paul Lewis<sup>2</sup> deserves repetition and emphasis: "Certainly it will be a most unfortunate thing for the progress of tuberculosis research if every substance showing interesting properties in the laboratory is immediately rushed to

the clinic regardless of consequences. In this situation patience is to be taken more than usually as an evidence of virtue."

W. H. FELOMAN  
H. C. HINSHAW

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- 1 Quenes and Minor Notes. Sulfone compounds for pulmonary tuberculosis, J.A.M.A. 121:798 (March 6) 1943
- 2 Lewis, Paul. Quoted by Wells, H. G. and Long, E R The chemistry of tuberculosis, Ed. 2, Baltimore, Williams & Wilkins Company, 1932, p. 450

#### THE WARRENS OF BOSTON

There used to be an old building on the Harvard campus in Cambridge, Massachusetts, a trifle larger to be sure but otherwise very much like the red schoolhouse that every country boy is familiar with. It had housed the medical school in years gone by and was familiarly spoken of as the Anatomy Building. It was here that Dr. John Warren was teaching in 1776 when the news came that his brother, Dr. Joseph Warren, a major-general of the line, had been killed at the battle of Bunker Hill. Dr. John, without ado, hastened out of the hall, shouldered a musket and joined the troops. There were two sons, both of whom became physicians. One, Dr. John Collins Warren, graduated from Harvard in 1797. He was one of the founders of the Massachusetts General Hospital and its chief surgeon the remainder of his life. He performed the first public operation in which ether was used as an anesthetic in October, 1846. The elder Dr. Reginald Fitz chose up to the very last to give his medical clinics in the same rickety old amphitheater where that epoch-making event had taken place. Dr. Fitz used to enliven his clinics by correcting errors of syntax in responses from his senior students, for although this was holy ground, was it not also cultured Boston?

Another Dr. John Collins Warren was born in Boston May 4, 1842, and died November 11, 1927. Many now living will remember this charming gentleman who graduated from Harvard in 1866 and served as professor of surgery until he reached the established age of retirement in 1907. He felt this inexorable rule very keenly, and mournfully expressed his regrets to the single visitor who attended his last operation while serving under that title at the Massachusetts General Hospital. It was an amputation of the breast for malignancy. He left the final closure to his assistants and graciously came over to one side of the room to visit. There was some rivalry at that time between Halsted of Johns Hopkins and Warren of Boston in this particular; each had developed a distinct technic in radical amputation of the breast, and Warren was naturally enthusiastic in explaining his method to others. There was no word of resentment, no sign of discouragement, but what the heart is full of the mouth speaketh, and so he expressed in simple language the opinion that he was now at his best. He probably was; no one could deny him that opinion. The visitor shook hands with a brave man but sensed a note of sadness in the parting. He lived twenty years after that.

A. E. H.

## News Items

Dr. R. C. Sherwood, St. Paul, food chemist, has been named by Dr. Russell M. Wilder, Rochester, Minnesota, as his assistant chief in the civilian food requirements branch of the food distribution administration at the department of agriculture in Washington.

Dr. R. F. Peterson, pathologist at Murray hospital, Butte, Montana, is the first physician from that state to be elected to the board of directors of the American Society for the Control of Cancer. His election took place at the annual meeting held in New York the first week in March.

Lt. I. L. Schuchardt, M.C., former Aberdeen, South Dakota doctor has returned to this country from New Guinea where he has been serving with the army.

Dr. R. T. Edward, Elysian, Minnesota is terminating his residence there after nearly thirty years of practice, to make his home with his sister at Bigfork, Montana.

Dr. A. W. Paulson, Dell Rapids, South Dakota, has been promoted to Lieutenant Colonel at Lubbock, Texas, where he is in command of the hospital of South Plains army flying school. This is his second promotion since his transfer to Lubbock from Randolph Field.

Dr. E. L. Tuohy, Duluth, introduced Dr. William O'Brien, director of postgraduate education at University of Minnesota on the occasion of the latter's public address "Recent Advances in Medicine" given March 8th. Dr. O'Brien urged Duluthians to support the anti-tuberculosis campaign, the cancer drive, the blood donor movement and health activities in general.

The Montana state legislature, in session at Helena, by action of a joint investigating committee, recommended the appointment of more trained doctors and the addition of needed equipment for the state hospital at Warm Springs. The report characterized the institution as understaffed. It asserted that psychiatric treatments should be stressed.

Dr. Irving Mauss, formerly of Hot Springs, South Dakota, has succeeded to the United States Health Department post at Rapid City left vacant by the transfer of Dr. F. H. Redewill to Sioux Falls, the latter city now rating fulltime health service because of the heavy influx of soldiers to the air base two miles outside the city.

Dr. Paul Bunker, president of Aberdeen District Number 1 Medical Society presided at the first Spring meeting of the district society in the Alonzo Ward hotel, at Aberdeen, South Dakota. The meeting was addressed by Dr. Paul Dwan, Minneapolis, head of the University of Minnesota human serum laboratories and technical supervisor of the blood donor centers of Minneapolis and St. Paul. Dr. Dwan explained the blood plasma program and illustrated his discourse with motion pictures.

Dr. Mario Fischer, Duluth city health officer and county welfare medical advisor, has filed a report with the St. Louis county board of commissioners on preliminary steps taken by health agency leaders toward the establishment of a semi-official health organization for the purpose of coordinating anti-tuberculosis activities in St. Louis county. This will be known as the "Advisory Committee of Tuberculosis" and Dr. Fischer will act as chairman. The committee will present a ten-year plan for the county which has one of the highest tuberculosis death rates in the state.

Dr. Herbert T. Caraway, Billings, Montana, has been named by Governor Ford to be chairman of the Montana war health committee, established in February. Also appointed were Drs. Wm. F. Cogswell, Helena, secretary of the state board of health and Ernest D. Hitchcock, Great Falls, president of the State Medical Association, as well as Maj. Chas. F. Jump, Helena, medical officer of the state draft board and the secretary of the state dental association. The committee was created at the suggestion of the war man-power commission.

Dr. Reuben H. Waldschmidt, president of the Sixth District Medical association of North Dakota, presided at the monthly meeting of the association held March 2 in the Grand Pacific Hotel, Bismarck. Papers delivered were "Treatment of Acute Respiratory Diseases of the Child," Dr. Edmund Vinje, Beulah; "Summary of Tropical Diseases," Dr. Alton C. Grorud, Bismarck; "Relation of the Physician to the Selective Service," Dr. Arthur C. Fortney, Fraine Barracks, state selective service medical officer; and "Relation of the Physician to the Procurement and Assignment Services of the Army and Navy," Dr. L. W. Larson, Bismarck, secretary of North Dakota Medical association. Program chairman was Dr. Carl Baumgartner, Bismarck.

Dr. W. F. Cogswell, Helena, Montana, was authorized by the state board of examiners to attend the 41st annual meeting of the United States public health service in Washington, D. C., March 24 and 25.

Dr. Douglas L. Jacobs, Willmar, Minnesota, has been commissioned a Lieutenant (Senior grade) in the United States Navy Reserve and ordered to report to aviation headquarters of the Navy at its San Diego California base.

Lieutenant Lynn M. Hammerstad, Minneapolis, flight surgeon attached to the naval aviation cadet selection board of that city, has been ordered to duty in the western Pacific war theater.

Dr. F. M. Knierim, Glasgow, Montana, who practised in eye, ear, nose and throat ailments at Lewistown prior to removing to Glasgow in 1934, has been commissioned a lieutenant commander in the Navy and has gone to headquarters of the Thirteenth naval district at Seattle, Washington, for assignment.

First Lieutenant T. G. Wellman, M.C., Lake City, Minnesota, the fourth doctor to have left the Lake Pepin community for service with the Armed Forces, is now stationed with the medical corps of the Army Air Corps at Miami Beach, Florida.

The annual meeting of the Montana State Medical Association will be held in Billings July 7th and 8th.

Dr. E. C. Person, Roundup, Montana, has been detached from the battleship Idaho, on which he served nearly two years and has been assigned to graduate work in reconstruction surgery at the Mayo clinic, Rochester, Minnesota.

Dr. Gordon C. MacRae, Duluth, has been promoted from major to lieutenant colonel, according to word received from Camp White, Oregon, where Lt. Col. MacRae is serving with the 81st General Hospital unit.

Dr. Reinhard Schmidtke, Montevideo, Minnesota, has been appointed assistant to Dr. Frank Burch, Sr. Paul, mainly at Miller Hospital and at the Wilder Dispensary. Dr. Edw. Burch is serving with the Armed Forces.

Dr. Herbert A. Burns, Minneapolis, who resigned last fall as superintendent of Ah-Gwahl-Ching sanatorium to head a tuberculosis survey of state hospitals, under the direction of the division of state institutions, is about to disclose the findings of the work which has been in progress five months. It is expected that it will point toward obtaining legislation to shelter tuberculosis patients among the insane, feeble-minded, epileptic and inebriate groups in state hospitals. Treatment of such patients in their present situation is limited; their death rate is higher than from the disease in other elements of the state population: they constitute a health hazard when released to return to their homes.

Mrs. I. H. Mauss, Rapid City, South Dakota, wife of the public health officer of Pennington county, has been conducting a pinworm survey among school students in Fall River and Custer counties. 400 students were examined, all with parental consent. The results are expected to be released for publication very shortly.

The Montana Academy of Oto-ophthalmology met in Butte on Feb. 21-22 at its 40th semi-annual meeting. A scientific program was presented and at the business meeting, the officers elected for 1943 were: President, Dr. Wm. Morrison, Billings; secretary-treasurer, Dr. F. D. Hurd of Great Falls.

## Necrology

Dr. Henry Lombert Knight, 81, of San Pedro, California, former staff member of Eitel hospital Minneapolis for ten years and later Mower county physician, died February 2 of carcinoma of the hip. Dr. Knight was graduated from Rush Medical College in 1884, spent two years each in two study periods in Berlin and Vienna and practised in Minneapolis from 1906 to 1928.

Dr. Andrew Clark, 78, of Billings, Montana, died March 7th at a Billings hospital of a heart ailment. His wife, also a doctor, died in 1934.

Dr. H. F. Bright, 65, of Elk Point, South Dakota, died March 22. He had practised 44 years at Blunt, White Lake, Mitchell, Alcester and Elk Point.

Dr. Arter Wayne Deal, 60, of Lewistown, Montana, died March 13 at Lewistown following nearly fifteen years of failing health. Dr. Deal was a graduate of the college of physicians and surgeons of the University of Maryland and for four years prior to 1907 was chief resident physician of Mercy Hospital in Baltimore. He served from 1907 to 1911 as superintendent of Montana state hospital at Warm Springs after which he resided in Lewistown and practiced there until his retirement some years ago. Dr. Deal was appointed surgeon for the Great Northern Railway in 1917, was made chief of staff of St. Joseph's hospital, Lewistown, in 1919, member of the Montana state board of medical examiners in 1920 and, in 1925, became president of that board.

Dr. Francis Gustave Lagerstrom, 67, of Minneapolis, died March 13 at Minneapolis. He was born in Sweden, graduated from Kansas medical college, Topeka, and practised at Lindstrom, Minnesota for seven years before coming to Minneapolis where, for the past twenty-five years he has been a physician and surgeon.

Dr. Chas. Frederick McComb, 85, of Duluth, eight times elected coroner of St. Louis county, died at his home March 13. He had been a Duluth resident and physician for sixty years.

Dr. Thos. J. O'Leary, 61, of Superior, Wisconsin, died February 26 after he had been stricken by a heart attack the night before. Dr. O'Leary was a native of Wabasha, Minnesota, whence he removed to Superior in 1906. At the time of his death he was serving as councillor of the Wisconsin State Medical society.

Dr. Otoniel Trejos Flores, 54, of Dodge Center, Minnesota, died March 6 at St. Mary's hospital, Rochester, where he had been a patient for three weeks. Born in Heredia, Costa Rica, Dr. Flores came to the United States 35 years ago and enjoyed a fellowship at the Mayo clinic for three years before practicing.

## IMMEDIATE COMMISSIONS OPEN TO 200 MEDICAL TECHNICIANS

It was announced recently at the headquarters of Major Gen. Kenyon A. Joyce, commanding general of the Ninth Service Command at Fort Douglas, Utah that first-lieutenancies will be granted to medical technicians able to meet special requirements. Parasiologists with four years of clinical practice or an equivalent in graduate study and who are particularly qualified for studies involving malaria and other tropical diseases are sought. Unless unusually qualified the maximum age limit is 48.

Biochemists, also, able to make chemical analyses of body fluids and to identify poisons of various types of origins though those examinations will be accepted between the ages of 35 and 55; excepting that nutritional specialists in biochemistry are not invited. The call is specifically for Montanans and Idahoans in this area and applications are to be submitted to the field office of the Salt Lake City Officer Procurement District, 449 Federal Building, Salt Lake City, Utah.

## NORTH DAKOTA STATE MEDICAL ASSOCIATION

**Fifty-Sixth Annual Session**  
**May 9, 10, 11, 1943**  
**Bismarck, North Dakota**

**Sunday, May 9th:**

First Meeting of the House of Delegates, 8 P. M.

**Monday, May 10th:**

Second Meeting of the House of Delegates, morning.

Beginning of Scientific Program, 1 P. M.

Buffet supper through courtesy of the commercial exhibitors, 5:30 to 8 P. M.

Scientific Program, 8 to 10 P. M.

**Tuesday, May 11th:**

Scientific Program: morning.

Round Table luncheon meetings: noon.

The meeting will close at the conclusion of round table meetings in time for those who travel by rail to catch late afternoon train.

In addition to several papers to be given by North Dakota physicians, the out-of-state guest speakers will include Dr. W. L. Benedict of Rochester, Dr. W. M. Spink of the University of Minnesota, Dr. L. G. Rigler of the University of Minnesota, Dr. P. K. Arzt from St. Paul, Dr. W. T. Peyton from the University of Minnesota, and Dr. Bryng Bryngelson, (Ph.D.), University of Minnesota.

Several interesting motion pictures will be shown during the day and a half Scientific Session.

### *Book Reviews*

**The Answer Is . . . Your Nerves**, by ARNOLD S. JACKSON, M.D.; Madison, Wisconsin: Jackson Publications; 200 pages. Price \$2.

This little book is a chatty discourse principally on the subject of the neuroses. The point of view is that of the busy practitioner who is attempting to explain to his patient in simple terms the origin, symptoms, and management of the neuroses. Addressed as it is to the layman, it tends to emphasize the brighter side of the situation and to avoid much mention of the diagnostic pitfalls which plague the medical man over and over in dealing with these cases.

For the most part a psychiatrist would not quarrel with the statements made though a few passages strike one as poorly considered; for example: "Surely a visit to a hospital with incurable diseases such as cancer or advanced tuberculosis would help to cure melancholia and self pity." (page 150). It might also increase a melancholia and generate a whole new train of hypochondriacal symptoms.

The following excerpt regarding shattered nerves hardly fits in with modern neurologic and psychiatric concepts: "Why do people seek operations unnecessarily? It is not an easy question to answer, but usually it is because they wish to escape from some distressing condition. They feel abused; they crave sympathy; they enjoy attention; their nerves are shattered . . . ." (page 36).

The book is interestingly written and is illustrated by some amusing drawings of cartoon type. It may well have a certain amount of utility as reading matter for patients but the physician who recommends it should prepare himself for discussion

with his patient on some of the mechanisms touched upon and only superficially clarified.

**Clinical Immunology, Biotherapy and Chemotherapy in the Diagnosis, Prevention and Treatment of Disease**, by JOHN A. KOLMER, M.S., M.D., Ph.D., Sc.D., L.L.D., F.A.C.P., and LOUIS TUFT, M.D.; Philadelphia: W. B. Saunders Company, 941 pages, 6x9 1/4, Illustrated, 1941, Price, \$10.

This is not a laboratory book but complete compendium of all important diseases responsive to biotherapy or chemotherapy with full descriptions of the prophylactic and immunologic methods applicable thereto, specific advice on the employment of sera, vaccines, and antitoxins (including prevention and handling of reactions) and detailed instructions, including exact dosage, on the use of the four sulfa drugs. Described in full are the technics of the tests that a physician may be called on to perform, together with instructions on how to interpret findings of tests essential in diagnosis and treatment. Blood transfusion and blood storage are dealt with extensively. The book is substantially a clinical discussion, pared to the bone and unimpeded by theory. It is the essence of practise and, as such, becomes an "assistant" to the practitioner.

The plan of the book is to state the general aspects of infection and immunity, biotherapy and chemotherapy; then to take up the various diseases and conditions, symptomatology and indications; to follow with the several methods of treatment that have been proved successful, informing when and why each was indicated. The quick-reference summary at the end of each chapter highlights each disease, and is presented graphically in the form of boxed tables. There is a practical table of end-results, as well.

**Volume Number I, Military Surgical Manual of Standard Practise of Plastic and Maxillofacial Surgery**: prepared and edited by ROBT. H. IVY, (chrm.), JNO. STAIGE DAVIS, Jos. D. EBY, P. C. LOWERY, FERRIS SMITH, Brig. Gen. LEIGH C. FAIRBANK, Medical Department, U. S. Army, Lt. Col. ROY A. STOUT, Dental Corps, U. S. Army, and contributed to by JNO. SCUDDER and FREDK. P. HAUGEN; Philadelphia: W. B. Saunders Company, 432 pages, 259 figures containing 899 illustrations, 1942, Price, \$5.

Each subject is covered from immediate care and management on the field to the last surgical service performed in the hospital, describing each technic, step by step and elucidating by means of the illustrations, which constitute one of the chief features of the book. The contents are divided into four sections: Reconstructive Surgery, Maxillary Surgery, Maxillofacial Prostheses and Anesthetic Technics. Typical is the first of these divisions. Beginning with general considerations it involves condensed discussions of important procedures, cheiloplasty, meloplasty, rhinoplasty, blepharoplasty, otoplasty, defects of scalp and cranium, cervicoplasty, loss of hard palate and premaxillary portion of alveolar process. The latter portions of the volume are likewise complete. Treatment of shock, control of bleeding, prevention of infection, supportive therapy—including use of chemotherapy—are developed to meet the needs of the medical officer under combat conditions.

**Volume II, Military Surgical Manual, Ophthalmology and Otolaryngology**; 331 pages, W. B. Saunders Company, Philadelphia, 1942 Price \$4.00.

The timeliness of this condensed volume dealing with ophthalmology and otolaryngology recommends it. The principles of military surgery and medical care relating to these specialties are treated concisely and practically. There has been an avoidance of subjects of a debatable character. Particularly, noted are specific methods of treatment which will lessen the complications in acute cases pending the availability of a specialist. Primarily written for use by the military surgeon the emergency conditions described in this volume often present themselves to the civilian practitioner for whom this volume would be a profitable investment. The work is excellently illustrated and the contributors are outstanding in their respective fields.



A NON-NARCOTIC REMEDY FOR RELIEF OF SPASTIC COLITIS

The effectiveness of \*Syntropan 'Roche' in the treatment of spastic colitis has been demonstrated by Weston (*Rev. Gastroenterol.*, 1912, 9:285). In a series of patients, some of whom had had symptomatic distress for as long as seven years, many experienced complete relief of symptoms following Syntropan therapy. The action of Syntropan 'Roche,' a non-narcotic antispasmodic, has been found superior to that of belladonna and its derivatives in the treatment of disorders due to smooth muscle spasm. Most important is the fact that Syntropan affords more direct antispasmodic effect with less likelihood of mouth dryness, mydriasis, or tachycardia.

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\*The phosphate salt of 3-diethyl-amino-2,  
2-dimethyl propanol ester of tropic acid.



S Y N T R O P A N ' R O C H E '

# Advertiser's Announcements

## 1943 SCHERING HANDBOOK AVAILABLE

The completely revised 1943 Schering Handbook is now available. It contains discussions of most recent therapy of major endocrinological disorders such as the menopause, dysmenorrhea, etc., and their treatment with hormones. The special applicability of Pranone to menstrual abnormalities, as well as other uses of the corpus luteum hormone, are described in detail. In addition to hormone therapy, the use of newer therapeutic agents, such as a gold compound, Solganal-B Oleosum for rheumatoid arthritis, and Sulamyd for urinary tract infections, will be found in the new Handbook. Listed are prices and packagings of all products including the recently reduced prices of Pranone, the orally effective corpus luteum hormone, and Proluton for injection. Copies are available from the Medical Research Division, Schering Corporation, Bloomfield, N. J.

## SULFONAMIDE PREPARATION FOR INTRANASAL USE

"Sulmefrin" is the name of a new preparation which E. R. Squibb & Sons has just released for intranasal use in the treatment of acute and chronic sinusitis and infections secondary to the common cold. The active ingredients of the new preparation are stabilized sodium sulfathiazole sesquihydrate and a vasoconstrictor, *dl*-desoxyephedrine.

With the demonstration that it was not always necessary to saturate the entire body with one of the sulfonamides in order to cure or prevent a local infection, various of the sulfonamide derivatives have been tried intranasally. For example, Dr. Frederick Myles Turnbull of Los Angeles reported in the J.A.M.A. in April, 1941, his results from the intranasal use of a 5 per cent aqueous solution of sodium sulfathiazole sesquihydrate. Among 47 patients with chronic sinusitis, 40 reported definite symptomatic relief to a greater degree than with any other preparation used. The solution, however, was not stable and had to be freshly prepared each time it was used.

Dr. Turnbull selected sulfathiazole because of its polyvalency as a bacteriostatic agent against Staphylococci, pneumococci and Streptococci which are the dominating organisms occurring in cultures taken from the nose and sinuses.

*dl*-Desoxyephedrine was selected as a vasoconstrictor because it is compatible in solution with sulfathiazole sodium, whereas ephedrine is not, and because it could be used at a concentration which would shrink the swollen mucosal tissues and promote drainage without blanching and yet not tend to produce unpleasant central side effects such as nervousness, sleeplessness and tachycardia.

Sulmefrin appears as a clear, aqueous, purplish pink liquid, with a slightly aromatic pleasant odor. It has a pH of about 9.0. It is relatively stable to air, light, oxygen and heat. Applied to the nasal mucosa it is practically non-irritating to the great majority of patients. Repeated tests under various conditions upon the nasal mucosa of rabbits have indicated that Sulmefrin had no more inhibitory action upon ciliary motility than a control solution of physiologic sodium chloride.

Sulmefrin may be administered by spray or drops, 5 to 10 minimis into each nostril, two to four times daily; or by tamponage, 20 minimis on each pack, applied for 15 to 30 minutes once a day.

Sulmefrin has undergone an extensive clinical study by qualified physicians over a period of many months. These studies indicate it to be a product of great value for the intranasal treatment of chronic sinusitis and upper respiratory infections. The preparation contains sulfathiazole sodium (sesquihydrate equivalent) 2.5 per cent; *dl*-desoxyephedrine hydrochloride 0.125 per cent; with 2.0 per cent anhydrous sodium sulfate as a preservative. Sulmefrin is supplied in 1-ounce and in 1-pint bottles.

## LEDERLE BLOOD PLASMA PLANT

Lederle Laboratories has greatly enlarged its facilities for dehydrating human blood plasma by building a new plant which processes blood donated through the American Red Cross for military uses. The value of dried blood plasma lies in its effectiveness in treating sufferers from shock. For this it is the practical equivalent of whole blood. Transfusions can be safely and promptly given by the surgeon actually on the field of battle where necessary.

While the blood plasma treatment is especially adapted to army conditions, naval requirements are somewhat different and are being met by the use of blood albumin especially prepared for the purpose. Blood albumin serves very much the same purposes, but since naval vessels have distilled water available and limited space, the more condensed form of blood albumin has important advantages.

Although both plasma and albumin are effective substitutes for transfusions of whole blood in most cases, there are occasions when whole blood must be employed. That requires that the blood of the donor be matched with that of the recipient, ordinarily a tedious laboratory operation. For this purpose, Lederle has developed a new technique based upon the use of the dried serum of the blood of rabbits as test substances to establish quickly and surely to which of four groups the blood of a person belongs. The blood of the rabbits used in making the reagents is taken from animals previously given injections of human blood long enough beforehand to insure the formation of excessive amounts of the reactive antibodies. The testing of a sample of blood by the new technique requires only a few seconds and no special equipment. Thus, grouping of the blood of every person in the armed services has become routine at the time of induction and a symbol denoting this type is permanently stamped on his identification disc. This greatly simplified the task of the surgeon in an emergency.

A similar technique has also been developed by Lederle for typing blood in cases where heredity and kinship must be determined. In this, the factors designated M and N, which are transmitted to offspring, are determined by the use of the dried plasma of rabbits, previously enriched in these factors by injections of human blood. From the known course of these factors in heredity, the test supplies strong presumptive evidence of consanguinity or lack of it. This is especially important in court proceedings.

## NOTED SCIENTIST IN VITAMINS ON BORDEN STAFF

The Borden Vitamin Company, which has been bringing into its fold a number of research and production leaders in that field, announces that Dr. Hugh H. Darby, distinguished Columbia scientist and author of many authoritative works, has joined its staff for research and development in the production and application of vitamins and hormones.

Dr. Darby, who has been with the Department of Biochemistry of the College of Physicians and Surgeons for the past seven years as research associate, is a specialist there on vitamins and hormones, achieving wide attention for his work on the extraction and physiology of sex hormones.

Among other distinctions, Dr. Darby is noted as the discoverer of the existence of vitamin D in plant life, and for his spectrographic research on vitamins A, D and K. He originated the system, widely used by the Department of Agriculture, of heat treatment for the destruction of harmful insects.

Announcement of Dr. Darby's new activities was made by Charles F. Kieser, vice president of The Borden Company and president of The Borden Vitamin Company, a division that has been expanding its activities widely in the production of vitamins.

## THERE HAVE BEEN RUMORS THAT PABLUM IS OFF THE MARKET

Pabena, the new Pablum-like precooked oat cereal, does not replace Pablum. Pabena is now being marketed in addition to Pablum. Pabena offers substantially all of the nutritional qualities of Pablum and all of its advantages of ease of preparation, convenience and economy. The base of Pabena is oatmeal (85%) which gives it a fine flavor and offers variety to the diet. Both Pabena and Pablum are made by Mead Johnson & Co., Evansville, Ind., for use in your own family.

## POSTOPERATIVE VITAMIN DEFICIENCIES

Prolonged chronic illness followed by sharp limitation of diet during a period of preoperative preparation, especially when surgery of the gastrointestinal tract is contemplated, may result in a state of partial vitamin depletion. Most parenteral fluids routinely contain glucose, which sets up an additional drain on the vitamin B stores in the body. Postoperatively, nausea and vomiting occur frequently and there is often the necessity for complete restriction of food for days at a time.

This sequence of events was clearly reproduced in a case recently reported (*Ann. Int. Med.*, 16:110, 1943). The patient developed a sore tongue and became uncooperative, disoriented, and confused. A dramatic change ensued after administration of riboflavin and nicotinic acid, with complete disappearance of the lesions within five days.

A number of laboratory procedures have been developed in recent years to augment the clinical diagnostic approach to vitamin deficiency disease, but many of them require special equipment and are not easily adaptable for routine clinical use. Physicians may obtain a list of vitamin values of foods and a bibliography of important and generally informative papers on vitamins by writing Eli Lilly and Company, Indianapolis.

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## INVALID DIETS: FOOD RATIONING

With the American public food-conscious as never before and the Civilian Food Requirements Branch of the FDA, Department of Agriculture, receiving countless inquiries from both physicians and patients, it may not be amiss to restate the official information on invalid diets and food rationing.

Ration Order Number Thirteen, issued by the Office of Food Administration covers all canned, dried and frozen fruits and vegetables and states unequivocally that consumers who need more processed foods because of illness may apply for more points than are available with War Ration Book Two. Such application may be made in person or by mail by the consumer himself or someone acting for him and is to be made only to the board for the place where the consumer lives. With the application must be submitted a written statement of a physician showing the reason, the amounts and types of processed foods needed for the next two months and why unrationed foods cannot be used instead.

The application form is OPA R-315 and is entitled "Sugar Special Purpose Application," having been developed as a requisition for home canners and being used for this new purpose only temporarily, until a more suitable one can be formulated.

If, on review, the local rationing board agrees that health depends on the applicant getting more rationed foods and that unrationed foods are unobtainable or unsuitable, one or more certificates will be issued for the number of points necessary.

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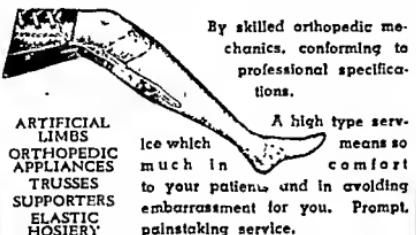
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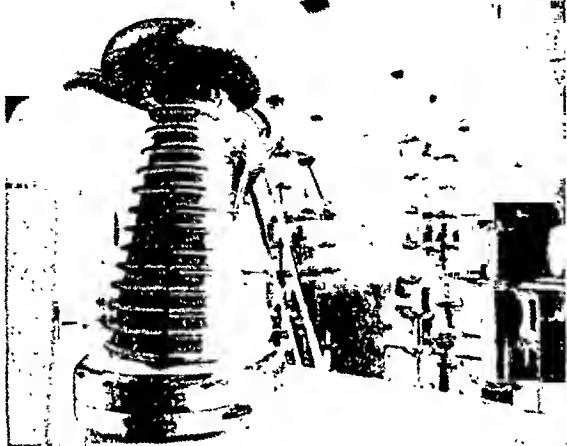
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\**Laryngoscope, Feb. 1935, Vol. XLV, No. 2, 149-154*  
*Laryngoscope, Jan. 1937, Vol. XLVII, No. 1, 58-60*  
*Proc. Soc. Exp. Biol. and Med., 1934, 32, 241*  
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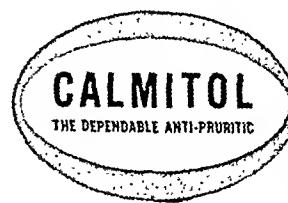


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### REFERENCES

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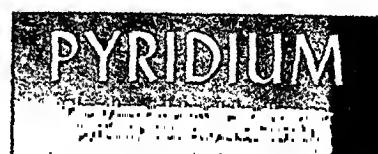
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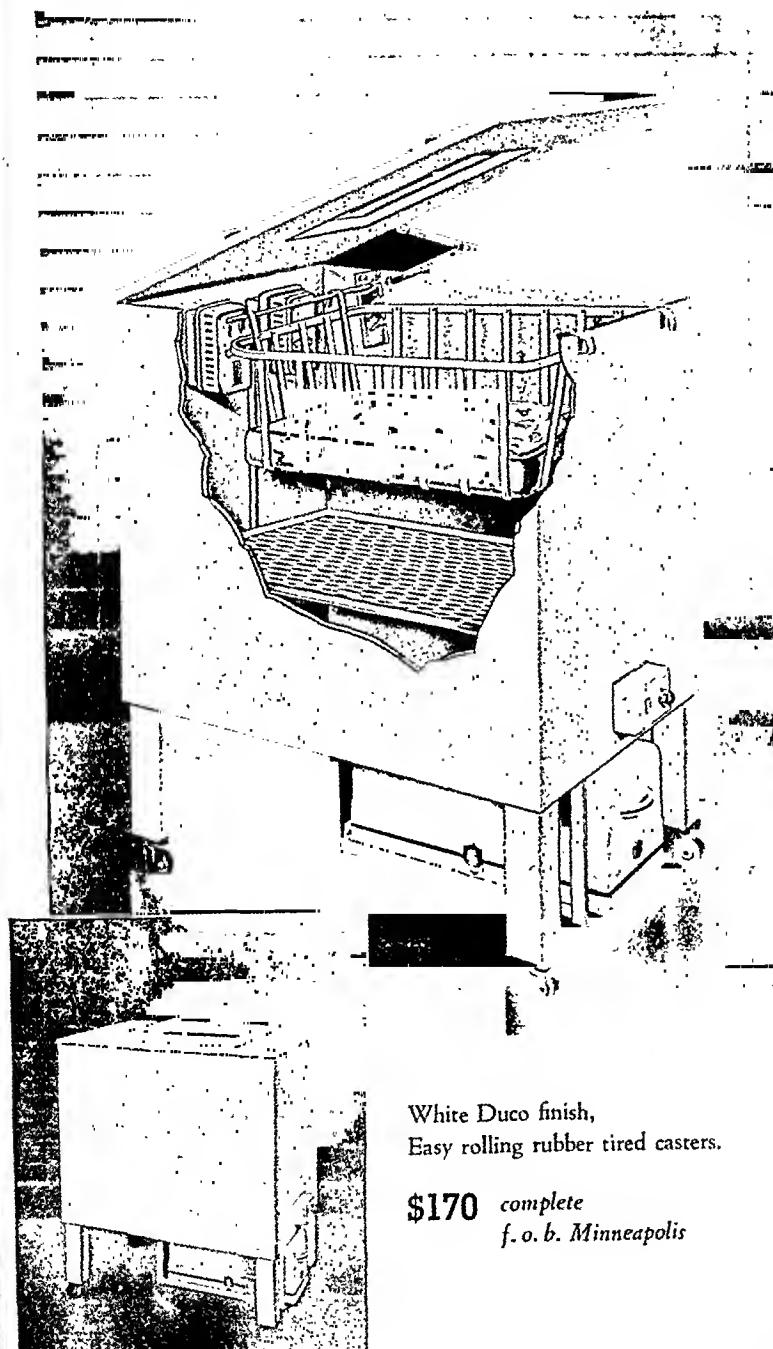
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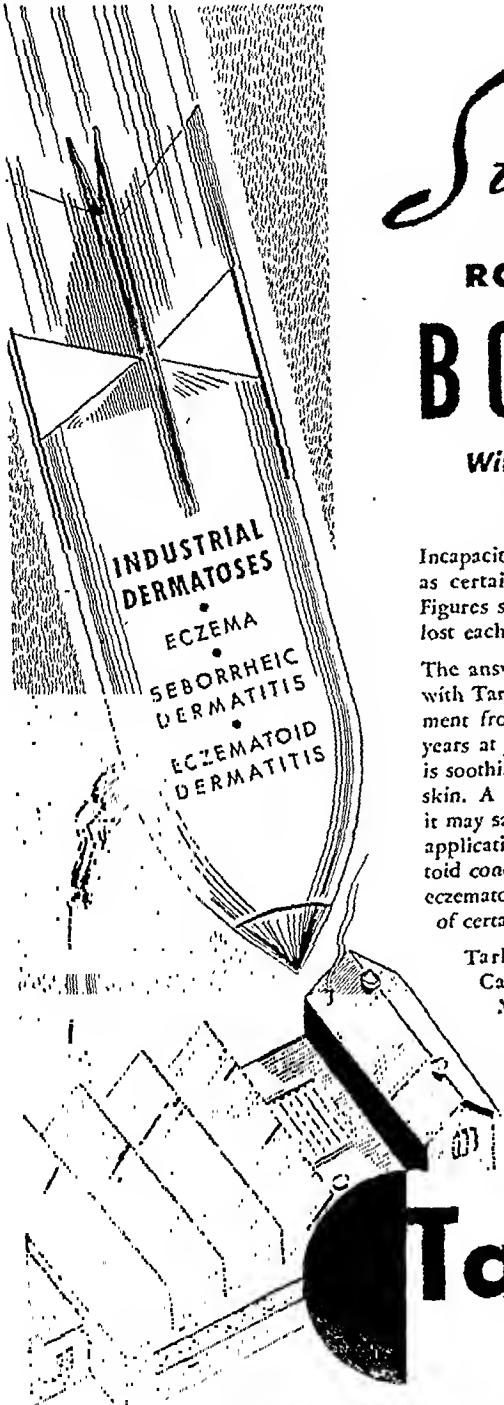
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# The JOURNAL LANCET

Minneapolis, Minnesota  
May, 1943

Vol. LXIII, No. 5  
New Series

## Pneumonia in Infancy *Pathogenesis and Pathology*

John M. Adams, M.D.<sup>†</sup>  
Minneapolis, Minnesota

### PATHOGENESIS

THE origin of pneumonia and the logical understanding of the pathogenic processes involved are still unsolved problems. Although the upper air passages are assumed to be the natural route of invasion, their significance in the pathogenesis of pneumonia becomes questionable when one considers that pathogenic organisms are found there frequently in the normal subject. Kneeland and Dawes<sup>1</sup> found an increase in pneumococci in the nasal cultures after a common cold; Kneeland<sup>2</sup> further showed that infants begin to harbor pneumococci at 2 to 3 months of age, but not necessarily associated with symptoms. Recent experiences recorded by Smillie<sup>3</sup> demonstrate that even infants can harbor pathogenic pneumococci for some time without developing pneumonia, unless some additional factor (such as an acute infection of the upper respiratory tract) lowers the resistance of the host, making possible invasion of the tissues of the lung. These studies indicate that some additional factor other than the presence of pneumococci must operate in producing pneumonia. Experimental studies by Robertson<sup>4</sup> on dogs list certain conditions as "essential for the production of the pneumonia lesion: first, the implantation of pneumococci in the terminal airways; second, a fluid but viscous medium which prevents their rapid expulsion from this region of the lung;

and third, the presence of local irritation." Local irritation appears more significant than obstruction in determining whether or not infection occurs. Robertson concludes that the escape of infected fluid exudate from the upper respiratory tract beyond the epiglottic barrier plays a much more important role in the inception of pulmonary infection than does the inhalation of bacteria-containing droplets.

Anatomically, the respiratory passages of the infant are absolutely smaller than in older children and adults, thus adding to the problems of obstruction and elimination of infected exudate. In addition, the infant lung is physiologically immature, so that the mechanisms of elimination such as cough and ciliary and muscular actions are not fully developed.

Preventing infected exudate from passing the epiglottic barrier appears to be a vital factor in the prophylaxis of pneumonia, with gravity undoubtedly playing a large role. By elevating the foot of the infant's crib, much can be accomplished toward avoiding gravitation of infected exudate into the air passages. Since the general direction of the trachea and primary bronchi is downward and backward, placing the infant on its abdomen with the foot of the crib elevated (as shown in Figure 1) facilitates drainage of infected mucus and exudate in the upper respiratory passages out through the mouth and nose. Gray's textbook of anatomy shows that the backward slope of the trachea is 25 degrees or more from

<sup>†</sup>From the Department of Pediatrics, University of Minnesota, Minneapolis.

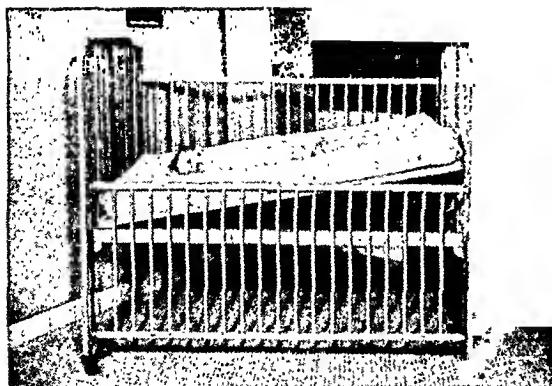


Fig. 1. A six months old infant showing postural drainage.

the vertical line of the ventral surface of the body (Fig. 2). By elevation of the crib approximately 15 degrees, the angle of the trachea with the horizontal approximates 40 degrees. I have found that infants suffering from respiratory infections are more comfortable on their abdomens as this position alone allows drainage of exudate from upper air passages by way of the nose and mouth. Elevation of the foot of the bed increases this drainage and seems to be well tolerated by the infant. The danger of choking on obstructing mucus is diminished as is the need for expelling this material by coughing. The mattress under the infant should be firm and flat, allowing free movement of the head to one side or the other. Robertson<sup>4</sup> advises elevation of the foot of the bed for several hours postoperatively to get rid of material aspirated during operation and to prevent flow of mucus into the lung. Dr. Clifford Sweet has emphasized the importance of postural drainage in the treatment of respiratory infections:

The most frequent diseases predisposing to and precipitating pneumonia are the common cold, influenza, measles and whooping cough. These infections are responsible for local irritation and congestion which appear to be essential factors in the pathogenesis of most of the pneumonias of early life. The factor of inherited or neonatal immunity has been shown to be important, experimentally and clinically. Woolpert, Dettwiler and co-workers<sup>5,6</sup> were able to infect the lungs of embryo guinea pigs with the influenza virus more readily than the lungs of full term offspring. In a previous study, Adams, Green, Evans and Beach pointed out the increased susceptibility of the prematurely born human infant to the virus of primary virus pneumonitis, with an 85 per cent mortality among these infants as compared with an 8 per cent fatality of full term babies.<sup>7</sup> In a study of interstitial pneumonia, Giesenbauer<sup>8</sup> reported postmortem observations in 46 cases, 33 of which were prematurely born.

In patients with chronic cystic fibrosis of the pancreas, death often results from secondary pneumonia or bronchiectasis. Careful study by Anderson<sup>9</sup> has shown a relatively high incidence, 23 per cent, of severe vitamin A deficiency in these infants. The pathologic change consists of a metaplasia of the epithelial linings of the pul-



Fig. 2. Roentgenogram of the lung showing the slope of the trachea and main bronchi with respect to the ventral surface of the body.

monary system and other organs, associated with xerophthalmia. It is possible that these lung changes prepare the ground for the invasion of secondary pyogenic organisms. Blackfan and Wolbach<sup>10</sup> state that "the early effect of the deficiency (Vitamin A) upon the respiratory mucosa is a satisfactory explanation of the frequency, severity, and persistence of the pneumonias that have been in most instances responsible for death."

Prematurity, cleft palate, and debilitating diseases are only too obvious as contributing factors in aspiration pneumonia. The aspiration of contaminated amniotic fluid may occur prior to or during birth, producing pneumonia.<sup>11</sup> Occasionally, through the same mechanism, thrush pneumonia is produced in the infant.

A pathogenic and etiologic classification of the pneumonias of infancy follows:

- I. ASPIRATION PNEUMONIA  
(Lipoid Pneumonia)  
(Thrush Pneumonia)
- II. TUBERCULOSIS  
(First infection type of Pneumonia)
- III. EOSINOPHILIC PNEUMONIA  
(Loeffler's Syndrome)
- IV. NON-SPECIFIC INTERSTITIAL PNEUMONIA  
(Pertussis, Measles,  
Atypical Pneumonia)
- V. PRIMARY VIRUS PNEUMONITIS
- VI. SECONDARY VIRUS PNEUMONIA  
(Goodpasture)
- VII. PRIMARY PYOGENIC PNEUMONIA
- VIII. SECONDARY PYOGENIC PNEUMONIA
- IX. SYPHILITIC PNEUMONIA  
(Pneumonia Alba)

#### PATHOLOGY

The predominating pathologic change in most of the pneumonias in early infancy is an interstitial mononuclear reaction. Sprunt<sup>12</sup> points out that an interstitial mononuclear pneumonia is only one phase of the lung reaction to almost all agents causing pulmonary disease. The only partial exception is in the primary and secondary pyogenic pneumonias, which on occasion will produce a predominantly mononuclear change.<sup>12</sup>

Therefore, in order to compare and differentiate these various forms of pneumonia, the specific histologic differences will be considered in relation to the etiology and development of each entity. Fat-laden macrophages and foreign body giant cells set apart the pneumonias resulting from aspiration of oils<sup>13</sup> (Figure 3). In tuberculosis, the epithelioid cell and typical giant cell are characteristic.

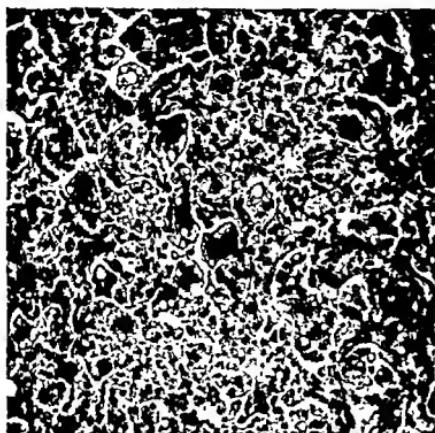


Fig. 3. Photomicrograph of section of lung showing consolidation due in part to complete filling of the alveoli with solid masses of oil-laden macrophages (courtesy of Dr. I. Ikeda).

tic (Figure 4). Wide-spread pulmonary infiltration of the eosinophilic cell, coinciding with high blood eosino-

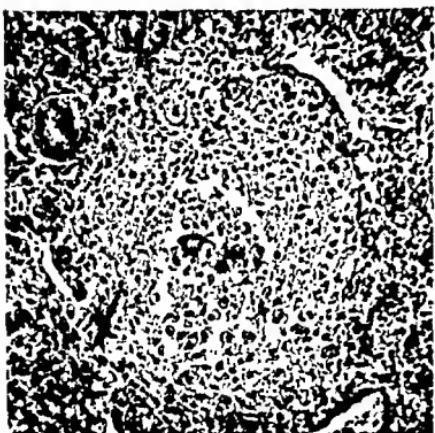


Fig. 4. Section showing tuberculosis of the lung with epithelioid cells and giant cell.

philia is diagnostic of Loeffler's pneumonia. The blood eosinophiles are larger than normal, with unusually large granules which are fewer in number than normal.<sup>14,15</sup> Von Meyenburg<sup>16</sup> recently reported autopsy studies in

this disease and found eosinophilic infiltrations in other organs as well as the lung.

The thickening of the various constituents of the pulmonary system seen in interstitial pneumonia is distinctive. Bronchiolitis and peribronchiolitis, thickening of interlobular and alveolar septa and infiltrations of lymphocytes and plasma cells are conspicuous (Figure 5). Gie-



Fig. 5. Section from the lung demonstrating the peribronchial sinus and small round cell infiltration with thickening of connective tissue elements in interstitial pneumonia.

senbauer<sup>1</sup> and Roulet<sup>17</sup> have recently described the detailed pathologic changes in larger series of cases. Giesenbauer<sup>4</sup> states that the exudate presents a honey-comb appearance, resembles fibrin, but does not take the same stains. The exfoliated alveolar cells frequently contain fatty and lipid granular inclusions.

*Primary virus pneumonia* of infants offers a singular opportunity to study the primary pathologic changes most probably produced by a virus in human lung tissues. Necrosis, ulceration and proliferation of bronchial epithelium are conspicuous changes, the exudate being predominantly epithelial and mononuclear, with no bacteria and few polymorphonuclear leucocytes. A mononuclear peribronchiolar infiltration adds to the microscopic picture (Figure 6). The specific distinguishing feature in these cases is the presence of characteristic cytoplasmic inclusion bodies in the epithelial cells of the bronchial, bronchiolar and alveolar tissues. These bodies have definite features, varying in size from three to six microns, stain acidophilic with the hematoxylin and eosin stain, are frequently surrounded by a clear zone or halo and sometimes have vacuoles within the substance of the inclusion (Figure 7).

*Secondary virus pneumonia* was first described by Goodpasture and his coworkers<sup>18</sup> in 1939 as a virus infection of the lungs following measles, and in one instance whooping cough. The unusual pathologic features are the presence of hemorrhage in the lung, isolated, or situated about areas of definite inflammatory consolidation, a stringy mucoid exudate, ulcerated areas in the

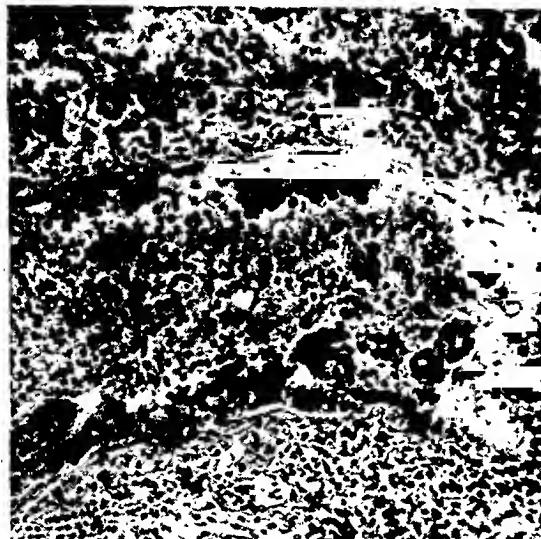


Fig. 6. Section from the lung showing bronchiole filled with epithelial exudate, necrosis and proliferation of lining epithelium, peribronchiolar mononuclear cell infiltration in primary virus pneumonia.

trachea and scattered areas of necrosis in the mucous glands. "The specific feature of the process was the presence of intranuclear inclusions, which were almost entirely restricted to epithelial cells" (Figure 8). "These involved cells rapidly underwent necrosis and this was the essential cause of the extensive ulceration."<sup>18</sup>

The changes in the lungs caused by the pyogenic organisms are well known. MacCallum<sup>19</sup> in the epidemics in 1918 and 1919 was able to differentiate the pneumonias by the distinctive pathologic anatomy produced by the various pyogenic organisms. This led him to the conclusion that epidemic influenza was probably due to a virus and not to bacterial agents acting as secondary and tertiary invaders in a host weakened by coincident or antecedent disease.

In syphilitic pneumonia the lungs are pale and specifically demonstrate extensive hyperplasia of the fibrous tissues of the interlobular and interalveolar tissues. *Treponema pallidum* are found in the large mononuclear cells.

Sudden death in infants previously well is still a very perplexing problem. The importance of pneumonia as a cause of sudden death in infants deserves special emphasis. The etiologic factor has seldom been determined, but the almost complete lack of polymorphonuclear leucocytes and bacteria in the microscopic sections of many of these lungs suggests a virus as a possible causative factor. Rivers<sup>20</sup> points out, "The fact that inflammation occurs in many virus diseases cannot be denied, and, despite the acute nature of some of the diseases, if secondary infections do not intervene, the inflammatory process is usually characterized by an infiltration of mononuclear cells." Sprunt<sup>12</sup> states that in "virus diseases the mononuclear reaction occurs in the acute phase of the disease and in others, as in pneumococcus pneumonia, in the stage of resolution." McCordock and



Fig. 7. Photomicrograph of section of lung showing bronchial cells containing typical cytoplasmic inclusion bodies from a case of primary virus pneumonia (oil immersion).

Muckenfuss<sup>21</sup> showed that in animals, viruses produce an interstitial mononuclear pneumonia. The distinctive change noted in the cases studied at the University of Minnesota is the presence of patches of mononuclear cells scattered throughout the hemorrhagic and congested areas of the involved lung (Figure 9).

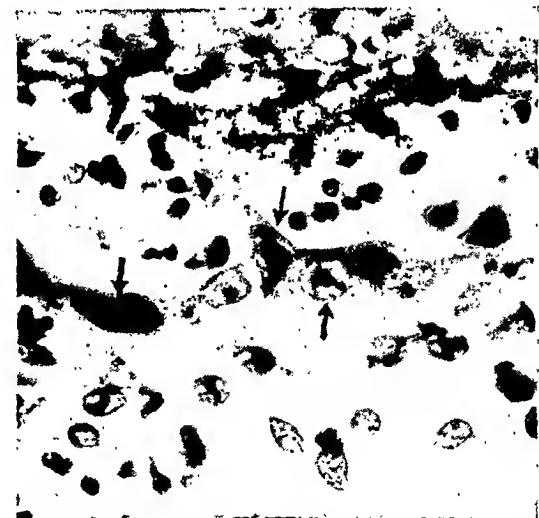


Fig. 8. Photomicrograph of section of lung showing typical intranuclear inclusions in secondary virus pneumonia (courtesy of Dr. E. W. Goodpasture).

#### SUMMARY

Logical understanding and management of pneumonia in infancy require a study of the pathogenesis of the disease. Anatomic and physiologic factors play a large role in the causation of these pneumonias. Postural drainage of infants is suggested as an important factor in preventing infected fluid exudate from reaching the lower

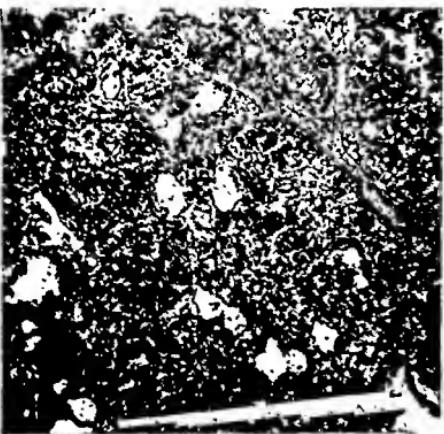


Fig. 9. Section of lung from a case of sudden death due to pneumonia, showing edema, hemorrhage and patches of mononuclear infiltration.

respiratory passages and, thus, in preventing pneumonia.

Aspiration of irritating oils, vitamin A deficiency, and antecedent diseases are undoubtedly of great significance in the pathogenesis of some cases of pneumonia. Lack of inherited immunity plays a role in the development of pneumonia, especially in prematurely born infants.

Careful study of the distinctive histologic features will aid in determining the specific cause of death.

Sudden unexpected death in infants may be due to pneumonia. The suggestions regarding postural drainage (such as sleeping on the ventral surface of the body) may aid in preventing these distressing deaths.

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## Acute Bacterial Meningitis

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**B**ACTERIAL infections complicated by meningitis are of especial interest at the present time because of the greater ease of spread during military and industrial mobilization with its attendant concentration and transfer of large numbers of persons. The acute meningitides due to the meningococcus, pneumococcus, streptococcus, staphylococcus and Haemophilus influenzae present a serious threat. Conflicting reports regarding the best therapeutic measures for the acute meningitides continue to appear in the literature. Any logical treatment should be from two fundamental angles: immunologic and chemotherapeutic.

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In the following communication the desire is to emphasize the fallacy of assuming that the sulfonamides are always adequate and that serotherapy need be used only when chemotherapy is failing. Not only has the treatment suggested for meningitis often been oversimplified but too many far-reaching claims have been made for chemotherapy alone. Any consideration or evaluation of the host's immune response is conspicuously absent in almost all reported studies.

The problems of treatment are directly related to the peculiarities of the pathogenesis of the disease and the biologic characteristics of the particular organism. The bacteria responsible for meningitis usually reach the men-

inges by the hematogenous route. Rarely, there may be direct traumatic implantation or direct extension from the middle ear, mastoid or paranasal sinuses. Burman and others<sup>1</sup> present evidence that even otorhinogenic meningitis results from the entrance of bacteria into the blood stream from the accessory sinuses or the temporal bone. In meningococcus meningitis bacteria invade the blood stream from a minute focus in the upper respiratory tract or from a purulent focus. The toxic products of the meningococcus cause a loss of integrity of the small blood vessel walls, thus allowing the entrance of bacteria into the blood stream,<sup>37</sup> and into the meninges through injured capillary walls.

The meningococcus, pneumococcus, and *H. influenzae* constitute an immunological group, in that they possess a similar pattern of chemical components acting as antigens.<sup>2</sup> Each of these organisms is surrounded by a capsule containing a specific carbohydrate (specific soluble substance), which is excreted into the surrounding medium. The quantity of free capsular carbohydrate is an index of the severity of the infection and is apparently correlated with the amount of anticarbohydrate (antibody) necessary for neutralization and recovery. Free capsular carbohydrate is excreted in the urine but that which remains in the body must be inactivated by natural or acquired antibody before the substance in the capsule of the bacteria can be neutralized. There is every reason to believe that the biology of the meningococcus and *H. influenzae* closely simulates that of the pneumococcus. The available evidence suggests that the protective antibody in both anti-meningococcus and anti-type B *H. influenzae* serum is the anticarbohydrate antibody. This antibody is an essential part of the recovery process even though its fabrication may be by the host. There is no evidence that sulfonamides influence the production of antibody. Since the capsular carbohydrate seems to be the invasive factor in the pneumococcus, meningococcus, and *H. influenzae*, any effective treatment must contribute to the elimination and neutralization of this substance.

The Gordon and Murray meningococcus types 1, 2, 3 and 4 are classified by Branham<sup>3</sup> into groups I (1, 3), II (2), III (4). The group II meningococcus differs in that its type specificity is intimately connected with a protein rather than a carbohydrate.<sup>4</sup> Group II meningococcus occurs more frequently in sporadic cases and is more apt to produce bacteremia and infection without meningitis. The meningococcus exotoxin, which Ferry<sup>5</sup> claims to have identified, has many of the characteristics of the capsular substance and in some types a capsule has been demonstrated. The biologic features of the pneumococcus are too well known to warrant description here. Pneumococcal meningitis is almost invariably secondary to a primary focus, and no specific type appears to be meningotropic. The type B *H. influenzae*, which is almost always that responsible for influenzal meningitis, is definitely encapsulated and grows in smooth colonies. Spinal fluid smears showing pleomorphic organisms should be considered strongly suggestive of *H. influenzae*. Lancefield Group A streptococci are the usual ones responsible for human disease. Like the pneumococcus, they are

encapsulated and any one of the 33 types can be the causative organism in meningitis. The staphylococci responsible for meningitis cannot be separated solely on the basis of colony pigment production, but virulent strains may be identified by coagulase production.<sup>6</sup>

Sulfonamides and antisera are the specific agents available for the treatment of acute bacterial meningitis. The part played by immune bodies has been largely overlooked in the general enthusiasm for the more easily used and generally more effective sulfonamides.

Antibody is an essential part of the recovery mechanism whether it is formed by the host as the result of infection or introduced by serum therapy. There is as definite a correlation between antibody production and recovery in the drug treated patient, as in those who get well spontaneously. The mode of action of the sulfonamides is bacteriostatic (i. e., interference with the metabolism of bacteria<sup>7</sup>), facilitating the defense mechanism of the host. Many patients will recover with chemotherapy alone, but some, because of the severity of the infectious process, and others because of an insufficient immunologic response, will need additional help in the form of specific antiserum. The antisera for the pneumococcus and *H. influenzae* act against the capsular carbohydrate. The available meningococcal antisera contain group "antitoxin" as well as specific antibacterial factors against the prevailing four types (Gordon) of organisms and they probably exert their influence against the capsule. Potent staphylococcal antitoxin is now available and although it has no antibacterial or known anti-capsular effect, it probably has value. Pooled convalescent scarlet fever serum contains some type specific, anti-invasive antibodies as well as erythrogenic antitoxin, and the use of this serum is an important adjunct in the treatment of Group A streptococcal meningitis.<sup>8</sup>

The appraisal of a therapeutic agent in acute meningitis is difficult. The many factors governing prognosis and the statistics relative to result obtained must be interpreted critically in order to reach a clear understanding of therapeutic effectiveness. Meningitis varies greatly from patient to patient and from time to time in a community. The age of the individual and the duration of the illness before treatment is initiated play significant roles in the outcome. When a treated case recovers, a little search may reveal instances of the same type of infection recovering without any specific measures having been employed. Moreover, as has recently been shown by Pittman<sup>9</sup> for the influenza bacillus, strains with the same virulence for mice show marked variation in susceptibility to sulfonamides. The outcome in any case of acute meningitis depends on the dosage of pathogenic organisms, the virulence of the organisms and on factors contributing to the resistance of the host. Also, the virulence of the pneumococcus, meningococcus and influenzal bacillus varies with different types.

New therapeutic agents may bring about dramatic improvement in the general fatality rate. For example, the fatality rate in streptococcus meningitis prior to the introduction of sulfanilamide was close to 100 per cent; it is now reported to be as low as 15 to 25 per cent.<sup>10,11,12</sup> The fatality rate for meningococcus meningitis, in spo-

radic groups of cases, is reported to have decreased from 50 per cent to about 10 per cent since 1937<sup>13</sup> although similar reduction was previously shown with massive intravenous serum therapy alone. United States government reports show a drop from 55 per cent to 45 per cent between 1933 and 1936, but only from 39 per cent to 35 per cent between 1937 and 1941. Sulfonamide therapy is generally given credit for the apparent marked improvement but other factors must be seriously considered.

Group I meningococci account for the majority of epidemic cases, while in carriers and sporadic cases, the Group II meningococcus is usually found.<sup>14</sup> The latter is less invasive and more apt to produce chronic infection. Group I meningococci constituted 90 per cent of the strains isolated in 1936,<sup>3</sup> but have been less frequent each year since with a corresponding increase of Group II. A lowered fatality rate also has been claimed for pneumococcus and *H. influenzae* meningitis during this period.<sup>12,16,18</sup> A critical analysis of large groups of cases does not substantiate the claim of marked reduction in mortality implied in some reports following drug therapy alone. Separation of reported cases into age groups, reveals that in the extremes of life, particularly infancy, the least improvement prevails.<sup>17,18</sup> Public Health Service reports since 1939 show a greater number of meningitis deaths from birth to five years than in any other age group. Top in Detroit has found no reduction in the fatality rate of meningococcus meningitis in children under 3 years of age since sulfonamides have been used.<sup>17</sup>

The high case mortality in the extremes of life is not due to variation in virulence of pathogens of the same type or to inability of the host to use conferred antibodies.<sup>19</sup> Frequent failure of meningitis to manifest itself as such in early infancy and the failure to make an early bacteriologic diagnosis in patients over one year of age, as well as the probable effects of anatomic, physiologic, and immunologic differences contribute to the high mortality. The immune response of a host varies with age, as has been shown by Sutliff,<sup>20</sup> Fothergill,<sup>21</sup> Hodes<sup>22</sup> and others. A definite lack of immunity to the pneumococcus exists between 10 days and 2 years of age.<sup>23</sup> The blood of children between 2 months and 3 years of age has been shown to have no antibacterial antibodies against influenzal bacilli.<sup>21</sup> Hodes<sup>22</sup> attempted to immunize children against the type I pneumococcus; all the children over 2 years of age showed a sharp rise in antibody titre, while a significant rise occurred in only one case under 2 years of age. Similar and more common clinical examples of poor antigenic response can be found in infants under 6 months of age, who have been inoculated too early against pertussis and diphtheria.

At the onset of meningeal infection when possible, an evaluation of the immune status of the host should be carried out so that complete therapy can be instituted at once instead of at a point where irreparable damage may have already been done. Since the amount of antibody essential for recovery varies with the severity of the disease, quantitative evaluation by determination of the amount of antibody in some serums in terms of milli-

grams of antibody nitrogen per unit volume is desirable. In the case of type B *H. influenzae* serum and pneumococcus serum results of analysis by this method parallel that by mouse protection methods; dosage of serum can be determined by amount of spinal fluid sugar. In meningococcus and *H. influenzae* meningitis, when no organisms can be found, a rapid diagnosis can be made by means of the precipitin reaction.<sup>19,24,25</sup> The need for and adequacy of serum therapy can be similarly determined. Cleared spinal fluid is used to overlay a few drops of diagnostic serum; a positive test consists in the formation of a white ring at the interface. Alexander feels that the time of appearance of the ring is an index of the amount of free specific soluble substance and therefore a measure of the severity of the infection. A severe infection is believed to be present if a ring appears within ten minutes. The Francis test in pneumococcus infections and an analogous test in *H. influenzae* meningitis when positive indicates the presence of excess free anti-carbohydrate antibody. A further method of determining antibody excess is capsular swelling—identical with the one used to type the organism except that the patient's serum is used in place of diagnostic serum. The aim is to build up such an excess of antibody that a 1:10 dilution of the patient's serum will produce capsular swelling.

The discovery of some effective prophylactic agent or procedure against meningococcus infections obviously would be of great value in the event of an epidemic, particularly since the disease is spread almost entirely by carriers and not by patients with the disease.<sup>26</sup> The current concentration of large groups of men increases the likelihood of an epidemic. It is believed that an increase of the carrier rate to over 20 per cent is definite warning of an impending epidemic.

There are several reports suggesting that the sulfonamides may be of value prophylactically, but more extensive trials are necessary before acceptance is warranted. Meehan and Hettler<sup>27</sup> were unable to control a series of outbreaks of cerebrospinal fever in a foundling hospital until they gave sulfapyridine to all the carriers. Fairbrother<sup>28</sup> believes that sulfonamides will have only a limited application for wholesale use, but that they are of definite worth in clearing proven carriers if used in adequate dosage. Gray and Gear<sup>29</sup> used sulfapyridine prophylactically during an epidemic in a military camp, the carrier rate dropping from 22 per cent to none. These reports are suggestive but do not warrant optimism without more extensive trials.

Statistics should be interpreted very carefully in meningitis because of the many factors previously mentioned which affect the prognosis. The results obtained at the Minneapolis General Hospital before and after the advent of sulfonamide therapy are tabulated below without fatality rates.

#### ACUTE MENINGITIS 1922 THROUGH 1942

	1922-1936		1937-1942		Total	
	No.	No.	No.	No.	No.	No.
Meningococcus	240	92	34	3	274	97
Pneumococcus	85	85	20	17	105	102
H. Influenzae	17	17	6	4	23	21
Streptococcus	137	135	13	3	150	138
Sphingoloboccus	15	15	3	1	18	16

The most striking improvement has been in streptococcus meningitis, while some reduction in the case fatality rate has occurred in each of the others. Prompt evaluation of the patient's immune status, i. e., precipitin tests, spinal fluid sugar, and capsular swelling, insofar as possible at the time of admission plus the more frequent judicious use of combined sulfonamide-serum therapy and eradication of focus have given improved results.

Organisms resembling pneumococci, meningococci, or H. influenzae may be typed by the Neufeld technic. As previously mentioned, in those cases in which the spinal fluid shows no organisms, cleated spinal fluid may be tested for type B H. influenzae and meningococci by means of the precipitin reaction.

#### MENINGOCOCCUS MENINGITIS

One lumbar puncture for diagnosis is usually sufficient, although additional punctures may be done after 24 hours, if there is reason to doubt the efficacy of the treatment or if signs of increased intracranial pressure appear.

All the common sulfa drugs appear to be effective in the treatment of meningococcus meningitis. The dosage used should be sufficient to maintain a blood level of between 5 to 15 milligrams per hundred cubic centimeters. It is not evident that higher levels are more effective (Bank's series).<sup>30</sup> The route of administration depends in part on the condition of the patient. The initial dose should be given intravenously to obtain the optimum blood concentration quickly. A one to 5 per cent solution of the sodium salt of sulfapyridine, sulfathiazole or sulfadiazine in normal saline may be used. The 1 per cent solution seems preferable for two reasons: it maintains the blood concentration at a higher level over a longer period of time and it also provides additional fluid. The sodium salts also may be given as a 0.4 to 0.8 per cent solution in physiologic saline subcutaneously. The use of the intravenous or subcutaneous routes is an additional advantage in patients unable or unwilling to cooperate. The crushed tablets or a solution of the sodium salt may, of course, be given through an indwelling gastric tube. The drug is probably best continued until the patient has been afebrile 4 to 5 days and then gradually decreased, although recent reports advocate prompt withdrawal with the first normal spinal fluid.

Serum should be given to any patient with meningococcus meningitis in the extremes of life and to any patient seriously ill.<sup>30,31</sup> Experimentally, combined chemotheraphy is definitely superior.<sup>14,32,33</sup> The practice so far has been to employ serum mainly in those cases which are severe or which have been refractory to sulfonamides. This point should be kept in mind when evaluating series of cases treated with sulfonamide alone or with combined sulfonamide-specific serum therapy, and should prevent arriving at unwarranted conclusions regarding the inferiority of combined therapy.<sup>34</sup> It is advisable to give intravenous fluids containing one of the sulfonamides for a period of three to four hours before the serum. The reasons and details for this will be referred to in connection with influenzal meningitis. The intrathecal administration of serum is not indicated,<sup>35,36</sup> as it seems unrea-

sonable to rely on the circulation of the spinal fluid to transport antibodies, when the blood can do it more quickly and directly; in addition, horse serum intrathecally produces an intense meningitis.<sup>14</sup> If within 24 hours the patient does not show definite increase in the spinal fluid sugar, 100,000 units antimeningococcus serum should be given intravenously, after sensitivity tests prove negative. This delay appears to be reasonably safe, at least in non-epidemic cases.

The patient's fluid and electrolyte balance should be maintained by oral fluids if possible, and parenterally if necessary. Repeated small blood transfusions are helpful. Freshly drawn blood is preferable to stored bank blood because of its greater antibody activity.

#### INFLUENZAL MENINGITIS

At the Minneapolis General Hospital the treatment for influenzal meningitis recommended by Alexander<sup>19</sup> has been followed as closely as possible. A continuous intravenous drip of 0.1 gram of drug per kilogram of body weight in saline or Ringer's solution is started at once. Sulfadiazine appears to be the drug of choice. This is given over a 4 hour period for the purpose of inhibiting further formation of free carbohydrate and accelerating the excretion of the free carbohydrate already present.

Anti-type B influenzal rabbit serum is then given intravenously, diluted in 200-300 cc. of sulfonamide-containing saline or Ringer's solution over a 2 hour period. The initial dose of serum is determined by the spinal fluid sugar level as follows:<sup>19</sup>

Spinal fluid sugar (mgm.%)	Mgm. antibody nitrogen
Under 15	100
15 to 25	75
25 to 40	50
Over 40	25

The adequacy of the dose is determined one hour later and every 24 hours, by testing the ability of the patient's serum to produce capsular swelling. The original spinal fluid kept on ice after adding 0.4 per cent formalin will serve as a source of encapsulated organisms. The aim is to have sufficient antibody so that a 1:10 dilution of the patient's serum will produce capsular swelling. If no swelling occurs, an additional 50 mgm. antibody nitrogen is given. Lumbar puncture should be repeated 24 hours after the original tap for determination of sugar, cell count, and culture. Need for additional punctures depends on the patient's course. Repeated small transfusions will furnish hemoglobin and antibodies. Sulfonamide therapy should be continued for one week after the first sterile spinal fluid is obtained or for two weeks after fever has subsided, for recurrences are not infrequent. A febrile response to the serum is not uncommon and is misleading. In those cases not responding to the above mentioned treatment the intrathecal administration of 5 cc. of human complement may help.

#### PNEUMOCOCCUS MENINGITIS

The same outline of treatment applies to pneumococcus meningitis as described for influenzal meningitis. Sulfadiazine or sulfapyridine and type specific rabbit serum

should be used. In determining the initial dose of type specific serum, 1 mg. antibody nitrogen is equivalent to 1000 units, and the dosage is then determined on the basis of the spinal fluid sugar level. Chemotherapy should be continued in full dosages at least one week after the spinal fluid becomes sterile. Particularly in this type of meningitis, foci of infection should be looked for and eradicated if possible. The adequacy of the serum administered should be determined by the Francis test and capsular swelling. The intrathecal administration of complement may be of value in this type of meningitis.

#### STREPTOCOCCUS MENINGITIS

Sulfadiazine or sulfanilamide in doses sufficient to maintain blood levels of 10 and 15-20 mg. respectively should be given and continued one week after the patient is afebrile and spinal fluid is sterile. Pooled human scarlet fever convalescent serum should be given if available.<sup>8</sup> Repeated small transfusions and the eradication of foci of infection are important.

#### STAPHYLOCOCCUS MENINGITIS

The principal points in treatment are the same as mentioned for streptococcus meningitis. Sulfadiazine, as in each of the others, appears to be the best drug, although sulfathiazole is probably very effective. The use of staphylococcus antitoxin intravenously is recommended. The initial dose should be 100,000 units.

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## Old Problems in New Settings

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**A**s the field of psychiatry developed its understanding of human behavior and perfected its techniques in treating patients with adjustment difficulties, the early formative years of the individual's life assumed increasing importance. At the same time the pediatrician was learning that emotional and personality problems were an important part of his practice and could no longer be ignored. This mutual emphasis has led to the formulation of a program designed to integrate the two fields more closely. It is natural that this should be developed in the medical schools. The Psychiatric Clinic for Children, established as a part of the University of Minnesota Medical School in October, 1938, is in line with this progressive trend in the field of medicine and medical education.

In the four and one-half years of the clinic's existence

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a total of seven hundred children has been accepted for study. It is significant that 34 per cent (238 children) were referred by the Department of Pediatrics because they presented problems psychosomatic in character. In addition, another 15 per cent were referred directly to the Psychiatric Clinic for Children by practicing physicians, because of complaints that did not seem to be produced entirely by physical disease. The problems included emotional and behavior disorders resulting from or related to organic disease or defect, emotional or personality disorders expressed through organic symptoms of dysfunction, behavior problems related to habit training and management, and difficulties related to intellectual development. This is contrary to the general experience of child guidance clinics where problems of medical interest constitute less than 10 per cent of the referrals. The explanation is the closer identification of these other

clinics with organized community social agencies such as courts, schools, or case working agencies in which the medical practitioner has had little interest.

The neurotic manifestations encountered in these children fall into more or less clearly defined categories. In the young child, refusal to eat, negativism, temper outbursts, whining, attention-getting behavior, and the recurrence of such infantile characteristics as soiling and enuresis predominate. In the school age group neurotics, enuresis, daydreaming and vague persistent physical complaints are frequent. In this group there has been a high incidence of school maladjustment, either as academic failure or achievement at a level far below potential capabilities. The physical symptoms that brought the child for study often proved to be devices unconsciously assumed to win sympathy or afford opportunity to evade responsibility and to avoid competition with contemporaries. In the adolescent group, there has been accentuation and perpetuation of these same characteristics, with clearer definition of the patterns of evasion, more pronounced complaints of pain, and, more than occasionally, hysterical reactions and anxiety states in addition to aggressive rebellion.

Throughout all age groups there has been a high incidence of intrafamilial conflict that induced a sense of insecurity within the child. Rejection by parents, unfavorable comparison with others within or without the family, expectation of superior performance in school and athletics, and the imposition of harsh demands and standards have been precipitating factors commonly encountered. Experience in this clinic confirms the often-expressed contention that the primary needs for normal, well-rounded emotional development in childhood must include strong and satisfactory affectional relationships, security and protection, and the opportunity for experimentation that will lead to eventual emancipation. Any lack in this basic constellation contributes to the production of frustration that may find expression in neurotic manifestations. These reactions may be encountered at an extremely early age, even before the child is intellectually capable of appreciating or evaluating conscious reaction. For instance, one infant of three months came to the Pediatrics Clinic because of persistent projectile vomiting. Thorough physical studies failed to substantiate the provisional diagnosis of pyloric stenosis. This child was the only child, born to middle-aged parents after many years of marriage. Both parents possessed many neurotic characteristics, were tense and apprehensive, feared that the child might not survive, and felt guilty lest the lateness of the pregnancy had "marked the child." Parental anxiety was obvious in every action toward the child, who was permitted no opportunity to relax and be peaceful. The child was brought into the hospital for a short period during which time the parents were reassured and their many questions answered in an effort to allay their anxiety. Separation of parents and child brought about a gradual release of tension. Better understanding and handling of the child was then possible and did much to overcome the persistent pylorospasm. Since so much has been written about the correction of feeding problems, negativism and tantrums in

the preschool period it will suffice to comment that our experience confirms the findings of others, namely, that intrafamilial tension producing insecurity and doubt in the child's mind as to his affectional acceptance is of great importance.

The period of the school years is a vital one, not well-understood and often inadequately managed. The division of responsibility between the school, the home and physician leaves many loopholes through which difficulties may develop. The tendency to consider each separate segment of the child's career as a detached entity without looking at the total integrated picture is the greatest weakness. It is during this period that vague and persistent physical symptoms growing out of the child's sense of inadequacy for competition may appear and become the foundation for a confirmed neurosis later on.

The immature child cannot evaluate his experiences, is unable to verbalize his anxieties, and consequently is prone to express his sense of futility in physical complaints that are accepted with greater sympathy and promise of action. Characteristic of this group is a nine-year-old girl, the fourth child in a family of five, referred for examination because of increasingly severe headaches and visual changes suggestive of a rapidly growing brain tumor. She was highly suggestible, and daily added new symptoms as a result of repeated medical examinations. The child's illness complicated an acute family situation, the war having eliminated the father's occupation that for many years produced a comfortable income. His present earnings from a night shift in a defense plant barely covered running expenses and provided little reserve for medical expenses incurred through the child's illness. The oldest child of this family was subnormal as a result of birth trauma. Natural chagrin led the parents to overemphasize the importance of school marks in their children. The second, third and fifth children, immediately older and younger than our patient, were of superior intelligence, while she was of average endowment. The mother had suffered a turbulent pregnancy with our patient, with prolonged pernicious vomiting that caused the father to suggest a therapeutic abortion. The physician's refusal to consider this proposal left a strong sense of guilt in the father. Because of her average intellectual endowment she found difficulty in equaling the achievement of her superior siblings. She was further handicapped by a progressive visual defect exaggerated by poorly fitted glasses. The resulting symptoms were steadily exacerbated by the over-anxious parents and the child's fears that she would fall still farther behind in the strenuous, unequal competition with her more brilliant siblings and be identified with the subnormal oldest child whom they had all been taught to protect. Careful neurological study revealed no evidence of tumor. The ophthalmologist established an exceedingly high refractive error which was corrected by properly fitted glasses. Psychological testing substantiated her average intellectual capacity but indicated severe retardation in reading and arithmetic achievement. The relief of parental anxiety and the substitution of a carefully considered school program that eliminated competition with the siblings and offered an opportunity for

achievement in school work has gone far in re-establishing this child on a healthy level. This type of patient does not require prolonged, specialized treatment, but the important points to be considered are the emotional factors that enter into the attitude of the parents and the relationships between this child, her siblings and the school program. A successful treatment plan must take account of all these elements. It would have been easy in a busy practice to limit attention to the provision of adequate glasses, which was only part of the difficulty. The unequal competition between the children, the over-emphasis on academic achievement, the child's fear of identification with the subnormal older sister, and the obvious hyperanxiety of the parents were of equal importance in the production of this child's problems.

In older children the physical symptoms have an even wider variation than in the pre-adolescent group. More mature reactions are expected, more responsibilities call for independent decisions, and often the child is not equal to the new burden. Under such pressures many purely neurotic manifestations without demonstrable organic pathology have been encountered. There have been many carefully controlled studies of the influence that emotional pressure may play in the production of such conditions as ulcerative colitis, gastric and duodenal ulcer and asthma in adults. It is our impression that the findings would hold equally true in children. We have observed repeatedly the increase in frequency of convulsive attacks on a well-established organic basis during periods of emotional stress. It is strongly suspected that in some persons with diabetes more insulin is required to maintain equilibrium during periods of sustained emotional tension. Such findings suggest that much greater consideration must be given to these phases of medical practice than has been customary.

The results of the routine examinations of men appearing at the induction stations, preliminary to military service, are disturbing. A rejection rate of 35 per cent unfit

for service because of physical or psychiatric defects should prove a challenge to medicine for years to come. The largest single group rejected, 9 per cent, have been those in the neuropsychiatric classification, the majority being of the psychoneurotic type. In medical practice, this group has been notoriously unresponsive to treatment. Part of the difficulty has been due to the physicians' lack of training and consequent disinterest in understanding these patients. In addition, the problem is too often complicated by the length of time symptoms have persisted before treatment is initiated.

The experience of the Psychiatric Clinic for Children staff has been that the most effective results can be obtained by preventive measures carried out with children who early show evidence of maladjustment expressed in physical symptoms without organic basis. Careful consideration of the emotional factors within and surrounding the child and efforts to eliminate the sources of friction will generally bring a satisfactory response. A consideration of emotional factors in every patient situation, but more particularly in those where complaints are not confirmed by physical studies, will yield increasing satisfaction to the profession as well as to the patients. While in the beginning this procedure may prove somewhat time-consuming it will prevent the consolidation of symptoms and evasions that become chronic. Viewed from that angle it is actually a time saver.

Probably better than half of the cases encountered in this clinic since its establishment could have been adequately cared for in the office of the general practitioner. The balance of the cases have been so complicated and of such long standing that they require the specialized service of a unit such as this. We feel the greatest contribution which a unit such as ours can make is to emphasize to the practitioner and the medical student the importance of considering emotional factors in every patient situation. As this goal is achieved there will be less need for referral to a clinic reserved for specialized cases.

## Gastric Ulceration Complicating Erythroblastosis Fetalis

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**P**EPTIC ulceration occurs in children at all ages, but gastric ulcer coexisting with erythroblastosis fetalis has not been previously reported. Two such cases are presented in this paper, as well as brief summaries of the records of two additional infants with intestinal ulceration.

In a splendid review of the literature Bird, Limper, and Mayer<sup>1</sup> collected reports of peptic ulceration of the stomach and duodenum in 245 children under the age

of sixteen years. They also presented the record of one patient upon whom they had operated successfully at the age of 34 hours for a perforated duodenal ulcer. Of these 246 patients 43 were two weeks of age or less when the ulcerations were discovered. The collected data indicate, therefore, that at no period during childhood does the incidence of peptic ulcer equal that recorded for the newborn period. The published reports also disclose a distinct tendency for peptic ulcers in young infants to bleed profusely and to perforate. As a consequence,

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melena, hematemesis, abdominal distension, cyanosis, and symptoms of prostration and shock comprise some of the more important manifestations of peptic ulceration in the early weeks of life. Subsequent to perforation the presence of free air in the peritoneal cavity may be demonstrated by x-ray study, and is of great diagnostic significance.

Since Bird et al, published their survey, a few additional instances of peptic ulcer in children have been reported by Bastman,<sup>2</sup> Moore,<sup>3</sup> and Conklin,<sup>4</sup> showing that in practically all of the recorded cases the ulcerations were grossly visible. In 1924, however, Kennedy<sup>5</sup> discovered a peptic ulcer of microscopic size in an infant with melena. This observation suggests the probability that peptic ulcers in infants may easily escape detection, and that their incidence may be appreciably higher than is indicated by the literature on the subject.

Apparently multiple ulcerations of the gastric mucosa are relatively rare in childhood. Cases of this character have been reported by Ritter,<sup>7</sup> Homen,<sup>8</sup> Delore,<sup>9</sup> Barber,<sup>10</sup> Butka,<sup>11</sup> Dunham,<sup>12</sup> Smythe,<sup>13</sup> Dunham and Shelton,<sup>14</sup> Mills,<sup>15</sup> and Kunstadter and Gottelman.<sup>16</sup> To this small group we add two additional cases. Furthermore, the gastric ulcerations present in the two infants under our observations coexisted with erythroblastosis fetalis. We are not aware of other reports of peptic ulceration complicating this disease.

The first patient was a full term male infant. The mother was well throughout pregnancy and the delivery was normal. Her Wassermann reaction was negative and the infant was exclusively breast fed. Previously the mother had given birth to two premature infants who died at the ages of eight and thirty-two hours respectively, the deaths being attributed to prematurity.

On the first day of life her third baby had a pronounced jaundice and twitchings of the muscles of the face. When admitted to the hospital at the age of three days he was distinctly dehydrated, apathetic, limp and icteric. The physical examination disclosed coarse moist rales over both lung fields and a definite enlargement of the spleen and liver. There was no evidence of inflammation of the stump of the umbilical cord and the remainder of the physical examination was normal. Three hours after admission to the hospital he regurgitated a small quantity of dark red fluid and this recurred periodically until the infant expired on the fourth day of life. Vitamin K was administered following the first hematemesis. Throughout the period of hospitalization the infant remained afebrile.

Examination of the blood made shortly before death revealed a count of 1.5 million red blood cells with marked anisocytosis, poikilocytosis and polychromatophilia. The incidence of normoblasts was 22 per cent. According to our laboratory studies the mother was Rh positive, indicating that some other factor was responsible for her infant's erythroblastosis.

The necropsy was performed immediately following death and was limited to the thorax and abdomen. It disclosed no evidence of inflammation of the peritoneum, pleura, pericardium or umbilical region. The spleen and liver were enlarged and in the latter, centers of hemo-



Plate 1.

poiesis were observed. Small hemorrhages were found in the medulla of each adrenal and many petechial pulmonary hemorrhages were present. The gastric mucosa was studded with numerous ulcerations measuring 3 to 5 mm. in diameter (Plate 1). Some of the ulcers extended through the muscularis but none penetrated the serosa. No evidence was found of thrombosis of blood vessels adjacent to the ulcerations. The remainder of the gastrointestinal tract presented no gross evidence of ulceration.

The second patient with multiple gastric ulcers complicating erythroblastosis fetalis was born in Charity Hospital, November 11, 1941, and died twenty-four hours later. The mother's Wassermann reaction was negative, and our laboratory study indicated that she was Rh positive. In this instance, also, the infant's condition was not related to the Rh factor.

The infant, a full term white female, weighed 8 pounds 7 ounces at birth. She was deeply jaundiced at the time of birth and shortly following delivery she developed attacks of cyanosis which recurred periodically until death ensued. The respirations were labored during these attacks but the heart sounds were normal. The liver and spleen were considerably enlarged. Examination of the blood revealed a red blood cell count of 2.4 million with a total of 101,000 nucleated red blood cells per cu. mm. During the brief period the infant was alive she received one blood transfusion.

The necropsy was performed two hours after the patient's death. It disclosed no evidence of inflammation, either of the umbilical region or of the serous membranes. Small petechial hemorrhages were observed in the thymus, epicardium, and in the lungs, and a small amount of clotted blood was present in the left middle cranial fossa. Since no torn intracranial blood vessels were seen the origin of this clot was not determined. The heart, pancreas, adrenals, kidneys, and lungs were normal and the bile ducts were patent. The liver and spleen weighed 295 and 80 grams, respectively, and extramedullary centers of hemopoiesis were noted in these organs as well as in the thymus and lymph nodes. Multiple small erosions about 2 mm. in diameter were present on the greater curvature of the stomach, but none had perforated the serosa. The remainder of the gastrointestinal tract appeared to be normal.

In addition to the cases of multiple gastric ulcerations complicating erythroblastosis fetalis, we have observed two infants with intestinal ulcerations which perforated.

The first patient was born of a mother who at the time of delivery was suffering from a severe diarrhea

which had been present for 24 hours. On the second day of life the baby had six blood-streaked stools. Forty-eight hours after the onset of the diarrhea the blood disappeared from the stools but their frequency continued. The abdomen became greatly distended and tympanic but this complication failed to respond to therapeutic measures. Subsequent to the development of diarrhea the infant's rectal temperature ranged irregularly in the neighborhood of 103° F. The Flexner type of dysentery bacillus was isolated from the infant's and from the mother's stools, and the former was given polyclonal dysentery serum. On the seventh day of life the baby died following a series of attacks of cyanosis.

The postmortem examination was normal except for changes within the abdomen. On opening the peritoneal cavity there was an escape of gas that was evidently under moderate pressure. The cavity contained about 100 cc. of fibrinous-purulent exudate, and fecal material was observed in the region of the ascending and transverse colon.

The mucosa of the entire intestinal tract was erythematous and numerous ulcerations were present in the terminal ileum, cecum, and the ascending and transverse segments of the colon. In addition, two perforations measuring 5 mm. in diameter were noted in the ascending and transverse portions of the large intestine.

The second infant with intestinal ulceration was delivered by Dr. Ada Kilbingerin of New Orleans. The mother was well throughout pregnancy and her Wassermann reaction was negative.

The infant seemed to be well until it was eighteen hours old when a rectal temperature of 101° F. developed along with a definite abdominal distension. The fever persisted and the distension increased but the cause of the infant's symptoms was not determined. The child died at the age of forty-eight hours.

At autopsy foul-smelling gas escaped from the abdominal cavity. An acute generalized peritonitis was present, and fecal matter was seen over the ascending colon and small bowel. The appendix was normal but on the anterior aspect of the cecum about 3 cm. above the base of the appendix a perforation with a diameter of 5 mm. was seen. Aside from the single perforation no evidence of intestinal ulceration was observed. The remainder of the postmortem examination was normal, no explanation being found for the perforation of the cecum.

In 1926 Kennedy<sup>17</sup> reported the presence of bacteria in the crater of a duodenal ulcer in an infant three days of age, and in 1933 Dunham<sup>12</sup> published the records of a newborn infant with multiple gastric ulceration due presumably to an infection with staphylococci. In one of our patients a perforated intestinal ulceration accompanied an infection with the Flexner type of dysentery

bacillus. These observations provide a rather conclusive indication that a variety of bacteria may cause ulceration of the stomach and intestines, but in many instances these conditions seem to be entirely independent of infection. The coexistence of gastric ulceration and erythroblastosis fetalis observed in two of our cases may have been an accidental rather than a causal relationship. This deduction derives support from the infrequency with which erythroblastosis has been observed in infants with peptic ulceration.

Our small group of cases provides a fair illustration of the chief manifestations of ulcerations of the gastrointestinal tract and their complications in young infants. These manifestations include hematemesis, melena, abdominal distension, convulsions, cyanotic attacks and the appearance of free air in the peritoneal cavity following perforation.

Ulcerations of the stomach and intestine occur with appreciable frequency particularly during the early weeks of life, indicating the need for careful consideration of this condition when young infants present typical or suggestive symptoms. The disease is serious, but by no means hopeless. In a few instances perforated peptic ulcers have been operated upon successfully in the newborn period, and it is probable that a larger number can be treated satisfactorily provided the condition is recognized promptly.

#### SUMMARY

- Four instances of ulceration of the gastro-intestinal tract during the neo-natal period are reported.
- In two of the infants multiple gastric ulcers coexisted with erythroblastosis fetalis.
- The coexistence of these conditions is considered to be an accidental coincidence.
- Two of our patients had perforated ulcerations of the colon. In one instance the condition was due to an infection with the Flexner type of dysentery bacillus. The etiology of the other perforated intestinal ulcer was not determined.

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# Experience with Hematogenous Osteomyelitis in Children\*

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**A**CCORDING to Key<sup>1</sup> one-half of one per cent of all general hospital admissions are for osteomyelitis. The age group most often afflicted is that between 9 and 14, and boys are afflicted about twice as often as girls. If the disease were a short-term indisposition, it would therefore not be of great economic importance, but it is still true that, for the majority of cases, those afflicted with the disease have it for the rest of their lives. Although the onset usually comes in the age period indicated, no age group is immune to the disease. Green and Shannon<sup>2</sup> collected 95 cases of the disease in infants under 2 years of age in 21 years at the Children's Hospital and the Infants' Hospital in Boston. At the other age extreme, Maxfield and Mitchell<sup>3</sup> reported five cases in five years in private practice. At the University of Minnesota Hospitals we have seen nine cases in the past five years, at least one of which started in the acute fashion of childhood osteomyelitis.

## BACTERIOLOGY

Staphylococcus is by far the most important organism in osteomyelitis. Of 697 cases collected from the literature by Key, 89 per cent yielded staphylococcus on culture; less than 5 per cent showed streptococcus; 2½ per cent showed pneumococcus and 2½ per cent showed mixed staphylococcus and streptococcus; the remainder were typhoid and influenza bacillus. Infants differ from other osteomyelitic patients in that they suffer from streptococcal infections twice as often as from staphylococci.<sup>2</sup>

## THE DEVELOPMENT OF OSTEOMYELITIS

It is generally agreed that hematogenous osteomyelitis is the result of a combination of circumstances. In 25 per cent of cases it is possible to demonstrate a definite lesion somewhere in the body from which a low grade bacteremia has resulted; in the remainder of cases such a lesion undoubtedly exists or has existed, but is of so minor a grade as to have been overlooked by the patient.<sup>1</sup>

Trauma is usually considered to be the deciding factor which leads to hematogenous osteomyelitis once a low grade bacteremia has developed; a definite history of trauma can be obtained in about 25 per cent of cases.

The question of why bacteremia results in infection in the bones has been studied by Hobo (cited by Key), who found that if India ink is injected intravenously into rabbits, it settles chiefly in the reticuloendothelial system and in the wide capillaries of the diaphysis of the long bones adjacent to the epiphysis. Key summarizes these

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facts thus: "If we correlate this with the fact that epiphyseal strains are especially apt to occur in growing children and that these may produce minute asymptomatic hemorrhages adjacent to the epiphyseal line, then we have a fairly rational explanation of the development of osteomyelitis in this position."

## ADVANCE OF THE DISEASE

Deposit and growth of pyogenic organisms in the ends of the long bones is followed by pus formation; and it is thought that infection is more severe, spreads more widely, and causes more toxemia than an abscess in the soft tissue because of the rigid walls that surround it. For the same reason, thrombosis of blood vessels also is more extensive. The abscess gains in size and follows the course of least resistance, until a means of escape is found, until the patient dies in toxemia, or until the resistance of the patient overcomes the disease without drainage.

Bone necrosis occurs, and much of this necrotic bone is absorbed, but if sufficiently large pieces become necrotic and are surrounded by pus instead of being in contact with osteoclasts and fixed tissue cells, absorption fails to occur, and sequestra form. The pus escapes by virtue of this destruction, most often into the marrow cavity, next most often through the haversian canals of the cortex to the subperiosteal space. From this position it may elevate the periosteum over wide areas, escaping into the soft tissues by virtue of perforation of the periosteum or even back into the bone at other levels through other haversian canals. Usually the periosteum is firmly attached at the epiphyseal line, and pus does not therefore escape into the joint adjacent; an exception to this is the hip joint, where the anatomical arrangement is different. Rarely, the infection passes directly through the epiphysis to the joint.<sup>1</sup>

New bone production occurs wherever living osteoblasts retain a good blood supply and are in relation to the infection. Such a situation obtains on the elevated periosteum, and here new bone is formed to make the involucrum. New bone also is believed to form throughout the haversian canal system, leading to gradually increasing density of the bone as the process becomes older.<sup>1</sup>

## THE CLINICAL PICTURE IN ACUTE OSTEOMYELITIS

In the typical case of acute hematogenous osteomyelitis, the boy becomes severely ill in the course of a very few hours. The temperature rises steeply, usually with chills, and prostration quickly appears. The patient may or may not have had pain in the involved bone or bones prior to the onset of the symptoms of septicemia. If the

patient survives, Roentgen changes in the bone appear in from 7 to 12 days, leaving a moth-eaten appearance in the bone involved. Earlier changes are not apparent because the picture depends upon resorption of bone, which proceeds slowly. There is great variability in the manner of onset of the disease, and some patients do not appear acutely ill at any phase of the disease, but the majority are extremely ill, and prostration is marked; this is true also of infants.

It is the rule that blood culture reveals many colonies of "coagulase positive" staphylococcus. The local signs include exquisite tenderness in the region of the involved bone, but this is usually not well enough localized to permit certainty as to the bone involved until days have passed. Local tissue swelling and heat and even redness may be equally confusing, particularly in the younger child. Definite differentiation from suppurative arthritis may be impossible for days.

#### CHRONIC OSTEOMYELITIS

If spontaneous or surgical drainage of the pus occurs, usually there develops a cavity within the bone filled with infected granulation tissue. Sclerosis of the bone occurs, and the bone becomes less well supplied with blood than normal and therefore less able to combat infection. From time to time minor traumata lead to exacerbations associated with fever, pain, and abscess formation. In some instances, sinuses to the skin form and drain for months or years; in others, the lesion becomes quiescent, and the skin heals, only to become reactivated at a later date. Coupled with these changes, sequestration occurs, and bits of dead bone either are extruded spontaneously or remain within the bone or soft tissues to keep the infection active until they are removed surgically. The course in chronic osteomyelitis differs little, whether hematogenous in origin or due to direct contamination from the outside.

Ultimately these patients may die of a variety of causes, such as septicemia, metastatic suppurative processes, amyloid disease, intercurrent infections, etc.

#### TREATMENT OF HEMATOGENOUS OSTEOMYELITIS IN CHILDREN AT THE UNIVERSITY OF MINNESOTA HOSPITALS

One hundred twenty-two patients under 21 years of age were treated for osteomyelitis at the University of Minnesota Hospitals from January 1, 1938, to January 1, 1943. It is proposed to discuss the results of a variety of the treatments advocated in the light of this experience.

**Experience with Acute Osteomyelitis.** Prophylaxis is possible to some extent in those known to have a low grade bacteremia, following the drainage of abscesses, in furunculosis, etc. In this group of patients, the likelihood of development of osteomyelitis should be considerably diminished by administration of sulfathiazole for a period and studious avoidance of trauma. This procedure has been followed in several cases in the recent past, but will be impossible to evaluate until a large series has been attained.

With regard to the management of fully developed acute osteomyelitis, opinion is divided into several groups,

those advocating immediate radical surgery,<sup>4,5,6,7,8</sup> those advocating operation after an interval of some days,<sup>9</sup> those advocating nonoperative management with drainage of pus when it becomes apparent in the soft tissues,<sup>10</sup> and those advocating nonoperative treatment throughout.<sup>11,12</sup> Crossan<sup>13</sup> made a summary in 1938 of all the methods of therapy advocated for acute osteomyelitis and reached the conclusion that the prognosis was poor by any method of therapy, implying that the very variety of treatments at that time indicated the inadequacy of any of them.

In a review of "Progress in Orthopedic Surgery in 1941," the American Academy of Orthopedic Surgeons concluded that neither complete conservatism nor radical surgery is in order.<sup>14</sup> It favors conservative operative measures when indicated, and supportive measures, including plaster. This policy has many advocates.<sup>2,15,16</sup> For several years the policy on the surgical service here was that of immobilization and elevation in plaster until pus became apparent in the soft tissues, demanding drainage.<sup>10</sup>

Our experience with this method in the past five years is portrayed in Table I. Twenty-eight cases of acute

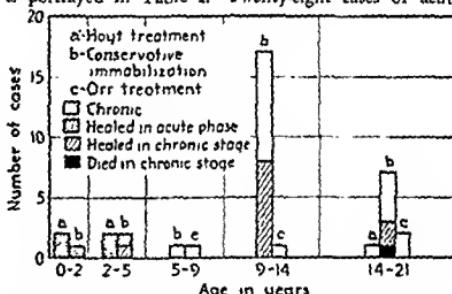


Fig. 1. Relation of age of patient to the result in 28 cases of acute osteomyelitis in children.

osteomyelitis in children treated in this fashion all went on to chronic osteomyelitis with the exception of 2 cases —disease in a humerus in a 2½ year old infant, and in two digits in a 1 week old infant. Of the 26 cases which went on to chronic disease, 1 died later of staphylococcus septicemia with terminal meningitis, 14 have failed to heal, and 11 have healed, 6 with continuation of conservative measures, 2 with the Orr method, 2 with the use of lucite drains, and 1 with sauerization and sulfathiazole implantation.

Orr<sup>8</sup> and Trueta<sup>16</sup> favor opening the bone, sauerizing, packing with vaselined gauze, and applying plaster, changing plaster and dressings only when the odor necessitates it. Orr reported a considerable series of successful cases, but few others have been as successful with the method. Pyrah and Pain<sup>17</sup> lost both of the patients on whom they tried the method.

At the University of Minnesota Hospitals, the Orr method was applied in 4 cases of acute osteomyelitis in the period under study; all became chronic, and all have failed to heal.

Combinations of sulfathiazole and surgical intervention have been used by many surgeons for acute osteo-

myelitis,<sup>18,19,20</sup> but there have been few cures. It is felt, however, that sulfathiazole helps to prevent the development of metastatic foci during surgical procedures.

Sulfathiazole was used as the sole therapeutic measure, aside from bed rest, by Hoyt and coworkers, in 8 cases.<sup>11</sup> Diagnosis was established by Roentgen film, blood culture, aspiration of abscesses, or, more often, by two or more of these measures. Even when fluctuation indicated pus in the soft tissues, they continued with nonoperative management, and found the abscesses usually resorbed without drainage. There were no deaths, only one case drained spontaneously, and 7 of the 8 were apparently healed completely at the time of the report. The blood levels were kept at about 3 to 4 milligrams per 100 cc. of blood for a period of some two months on the average. Since publication of the original article, this group has increased the number of cases to 17 with equally encouraging results.<sup>12</sup>

Up to January 1, 1943, 5 cases of acute osteomyelitis have been treated at the University Hospitals with bed rest, with or without plaster, and sulfathiazole by mouth over fairly long periods. This treatment, initiated by Drs. Spink and Paine in April, 1940, has been used with some success since in a few cases, although the tendency has been to drain when Roentgen changes have occurred. Of 5 cases so treated, 4, all under 5 years of age, healed without going into the chronic stage, and one became chronic.

A still more recent development is the use of penicillin in the treatment of the disease. This drug is particularly valuable because many times the organism becomes resistant to the sulfonamides as shown by Spink.<sup>21</sup> Florey and his group have given penicillin to 3 patients with osteomyelitis, with apparently some benefit in each of them.<sup>22</sup> The chief drawback is the tremendous cost of the drug.

Studies with the more specialized methods of chemotherapy are in progress under Spink at this hospital.

Among the whole group of patients with acute osteomyelitis seen, a most striking observation has been the difference in results associated with differences in age. Of 7 patients under 5 years of age, 6 healed without passing into the chronic stage, and the seventh healed later (after sauerization and sulfathiazole implantation). This experience tends to support the statements of Green and Shannon, that osteomyelitis in infancy is a disease from which recovery under conservative management is the rule.

*Experience with Chronic Osteomyelitis.* Baer's maggot treatment for chronic osteomyelitis<sup>23</sup> and the Carrel-Dakin therapy have been widely abandoned, and neither has been used at all here in the past five years. The bulk of the patients suffering from chronic osteomyelitis have been treated here in an expectant fashion, paying no attention to drainage as long as incapacitation did not result. Sequestrectomies have been performed, whenever drainage or fever has increased and Roentgen evidence of sequestra has been present. Plaster immobilization has been employed whenever increased fever, tenderness, or drainage has been manifest.

Chart II indicates our experience under this regimen.

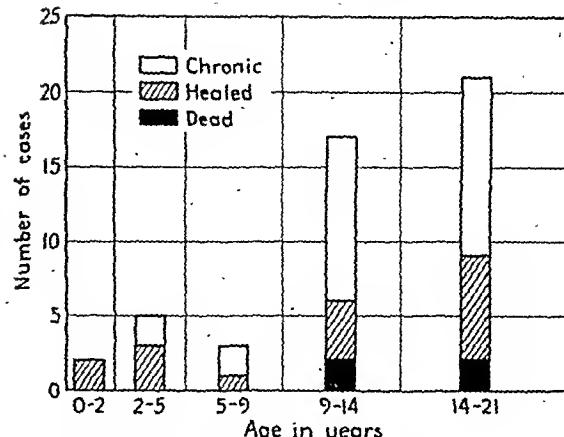


Fig. II. Lack of relation of age of patient and end result in chronic osteomyelitis treated by conservative measures.

Although the number of patients in the younger age groups is small, it seems apparent that the situation of the younger patients with the chronic disease is not as much more favorable than that of the older ones as is the case in acute osteomyelitis. This general impression is borne out under other treatments of the chronic disease also.

Our experience with all the chronic group is portrayed in Chart III. Of 47 patients treated expectantly, 4 died (one amyloid disease, 2 septicemia, and one meningitis), and 17 healed. The period of treatment required for healing usually was a period of several years, although a very few healed in a matter of months. Of the group of 26 cases which remained in the chronic stage, the bulk were followed for years. A most impressive observation on this group has been the great likelihood of recurrence, even after years of remission.

Nine patients with chronic osteomyelitis were treated here by the Orr treatment, and 3 of these ultimately healed. In 5 cases entire bones were removed, with or without sulfonamide implantation, and apparently complete healing has occurred in 3 of them.

One of the earliest reports on the use of sulfathiazole for chronic osteomyelitis in the literature is that of Paine and Spink from this clinic.<sup>24</sup> They sauerized the tibia in a 7 year old girl, and implanted 5 grams of sulfathiazole, closing the wound primarily. The wound healed primarily, and the patient is still symptom-free. A second patient was similarly treated, but at the time of the report it was too early to know what the result would be; this patient ultimately failed to heal.

Dickson and associates<sup>25</sup> reported 18 cases so treated; 14 healed primarily, 2 failed to heal, and 2 were too recent to allow judgement. Key<sup>26</sup> has had similar results, securing primary healing in 14 out of 17 cases. Baker<sup>27</sup> has observed that primary closure after sauerization and implantation of sulfathiazole is usually successful, but that if the wound is packed open after the implantation of the drug, results are no better than if the sulfonamide were not used at all. This observation may explain the failure of a case which was so treated by Spink and the author in February, 1940, apparently one of the first cases to receive sulfathiazole implantation.

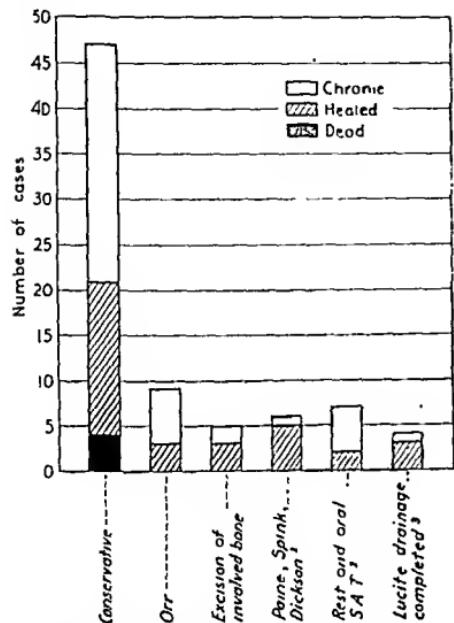


Fig. III. Results following various types of therapy for chronic osteomyelitis.

<sup>1</sup> Including adult—12 cases have been so treated—7 have healed & 2 of these patients were relieved of pain—they had no drainage at time of treatment.

<sup>2</sup> Other children are still under treatment—all are promising.

<sup>3</sup> Adults have also been treated with encouraging results. Ref to "Treatment of Chronic Osteomyelitis by Prolonged Dependent Drainage."

N.B.: In addition, 2 patients received no therapy and remained with drainage; one received sulfathiazole locally without sauerization without benefit, and 2 were treated with chemotherapeutic means to be reported by Dr. W. W. Spink.

Our complete experience with the Paine-Spink-Dickson<sup>1</sup> treatment is summarized also in Chart III. Of 6 children, 5 are apparently completely healed. Several adults have also been so treated; and the total figures for hematogenous osteomyelitis show rapid and clinically complete healing in 7 of 12 cases, but in no instance has the Roentgen appearance returned to normal. Of 2 additional adults, with chronic osteomyelitis resulting from fractures of the lower end of the femur, one has healed and one has not.

Seven patients with chronic osteomyelitis have been given bed rest and sulfathiazole by mouth for prolonged periods. In no instance has healing resulted, but in 2 cases with pain but no drainage, the pain has been relieved.

Finally, prolonged dependent drainage with "lucite" drains has been used in a series of 7 children and 5 adults.<sup>2</sup> The period for healing seems to be about 15 to 18 months. Of 4 children in whom this therapy has been adequately applied, complete healing seems to have occurred in 3. This method is of particular value in sites in which insufficient soft tissues are present to fill the defect after sauerization and sulfathiazole implantation.

## COMMENT

In view of the small number of cases studied, and the fact that each type of treatment was selected expressly for the case in hand, one cannot draw statistically sound conclusions concerning all the measures discussed. Nevertheless, it does seem justifiable to conclude on the basis of the figures presented and observation of the cases discussed that acute osteomyelitis in very young children is a more benign disease than in older individuals. It appears, also, that prolonged bed rest, best with plaster fixation, with oral maintenance of a sulfathiazole blood level of 3 to 5 milligrams per 100 cc. is the most effective measure in early acute osteomyelitis, regardless of the age of the patient. In the chronic disease, the choice would appear to lie between sauerization, sulfathiazole implantation, primary closure, and plaster on the one hand, and prolonged dependent drainage with lucite tubes on the other.

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# Responsibilities of the Physician in the Problem of Rheumatic Fever in Children

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**I**N light of the great progress made during the past two decades in securing public and professional support for extensive programs aimed at the control of two other serious diseases of childhood, namely, tuberculosis and poliomyelitis, it is difficult to understand why recognition of rheumatic fever as a major devastator of our children has been so tardy. Again it is the war which has compelled us to give attention to an important problem, admittedly neglected in peace time. Examination of the figures of the Selective Service, as presented by Roundtree et al.<sup>1</sup> reveals that defects of the cardiovascular system are responsible for the largest number of rejections among young men who are disqualified for any military service. It is well known that most of the individuals who survive acute rheumatic infection in childhood carry scars in the heart valves. This fact, together with the knowledge of the high incidence of rheumatic disease in school children, justifies the assumption that rheumatic infections during the childhood period play the major role in producing the total physical unfitness due to cardiovascular disease in young adults.

The practicing physician is fully aware of the importance of the social, educational, economic, public health, geographic and military aspects of the rheumatic fever problem. He is likewise thoroughly sympathetic with investigative work which promises to clarify the fundamental etiology of the disease. However, his greatest responsibility at the present time is that of learning to diagnose the disease in its early stages. Being aware of its protean manifestations, he will welcome the time when more specific diagnostic tests are developed which will enable him to direct the care of his patients more successfully. He, above all people, is cognizant of the need for a really effective form of specific therapy for the active disease. In lieu of such a boon, however, he must be content, for the present, with measures which ameliorate the condition in any way. The fact that methods have been brought forth which appear to be effective in preventing recrudescences of the disease offers some encouragement. The purpose of the present paper is to consider those aspects of the rheumatic fever problem for which the physician has direct responsibility, namely, diagnosis, treatment and prevention of recurrences.

## DIAGNOSIS

Of prime necessity in the diagnosis is thorough familiarity with the extremely variable manifestations of rheumatic fever in children. These have been discussed at length by many writers, so only cursory mention of the main categories is given here for orientation: (a) chorea minor, (b) subcutaneous fibroid nodules, (c) rheumatic arthritis, (d) rheumatic carditis (pericarditis, myocarditis, endocarditis-pancarditis), (e) rheumatic erythema or

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purpura, (f) miscellaneous tissue—throat, kidneys, and serous membranes, (g) general evidences of infection.

Valuable information in making the diagnosis of rheumatic fever is obtained by routine laboratory studies, sedimentation rate of the erythrocytes, electrocardiographic and roentgenologic findings. Text books and various articles mention about fifty different conditions whose manifestations are such that they may be considered in the differential diagnosis of rheumatic fever.<sup>2</sup> The author has tried to simplify the diagnosis of rheumatic fever from a practical point of view by studying hospital records; first, by consideration of disorders which were believed to be rheumatic fever and subsequently found not to be, and second, by consideration of diseases thought to be responsible for the symptoms which were actually due to rheumatic infection.

The case records of 982 children admitted to the pediatric wards of the University of Minnesota Hospital during the year 1941 were studied in regard to the diagnoses made on admission by the intern and resident staff members and referring physicians. Over one-half of these children were between 5 and 15 years, the usual age incidence of rheumatic infection. Rather surprising was the fact that rheumatic fever was mentioned in the differential diagnosis on 20 occasions. The conditions which proved to be responsible for the symptoms in these children were:

Acute osteomyelitis	.....	4
Hyperthyroidism	.....	3
Leukemia	.....	2
Acute glomerulonephritis	.....	2
Poliomyelitis	.....	1
Hodgkin's disease	.....	1
Hysteria	.....	1
Catarrhal jaundice	.....	1
Chronic infectious arthritis	.....	1
Recurrent tonsillitis	.....	1
Idiopathic hypoprothrombinemia (symptomatic purpura)	.....	1
Purulent pericarditis	.....	1
Toxic myocarditis following scarlet fever with mastoiditis and lateral sinus thrombosis	.....	1

It is evident from the foregoing list that a wide variety of disease states may present symptoms which simulate those of rheumatic infection. Patients having such symptoms constituted nearly 3 per cent of the total number of school-age children admitted to the Hospital. If obviously non-rheumatic patients, such as those admitted for treatment of congenital deformities, fractures, diabetes and epilepsy, are excluded from consideration, the incidence of cases in this series presenting signs or symptoms suggestive of rheumatic infection is found to be slightly more than 10 per cent.

It may be very difficult at times to ascertain the true diagnosis early in the course of acute osteomyelitis; that this occurred on four occasions during the period studied

is significant. In three children with hyperthyroidism there was sufficient similarity in the manifestations to cause chorea minor to be mentioned as a diagnostic possibility. Children in the early stages of acute lymphatic leukemia may present symptoms and signs suggesting acute rheumatic fever, such as arthritic-like pain, hemic murmurs, epistaxis, and fever. During the year 1941, two such cases were encountered and another was seen during the past winter. Similar cases have been reported in detail by a number of authors. In one instance in this series, acute rheumatic fever was the diagnosis given when the patient was suffering from infantile paralysis. This is especially likely to occur in the non-epidemic cases of poliomyelitis, because of the prominence of joint and muscle pain.

From a somewhat different point of view, namely that of cardiac involvement, confusion arose because of nephritis. Cardiac failure may occur in children with acute glomerulonephritis, a phenomenon which has been stressed by Rubin and Rapaport,<sup>4</sup> and this fact explains the mistaken diagnosis of acute rheumatic fever in the two cases here encountered. The child with Hodgkin's disease had complained of pain in various parts of the body for some weeks before the diagnosis was finally established by histologic examination of a biopsy specimen. The 10 year old boy in whom rheumatic fever was strongly suspected but who proved to have hysteria, complained of polyarthralgia for a period of several months before coming to the hospital. Previous administration of salicylates had been ineffective. On admission to the hospital the sedimentation of the erythrocytes was found to be normal. Rather dramatically in a few days the symptoms subsided without the aid of therapeutic measures and further questioning by the interns and psychiatric staff revealed distinct conflicts in the child's life. The diagnosis of hysteria seemed fully justified in view of later findings.

There is a little more difficulty in understanding why the child with jaundice was thought to have rheumatic fever although he had complained of abdominal and body pain for some time before the icterus was noted. Confusion of acute rheumatic fever with chronic infectious arthritis is not unusual during the early phase of the latter disease as was the situation in the patient in this series. The association of body aches and pains with upper respiratory infections, no doubt explains why one boy was thought to have a rheumatic infection when he had closely recurring episodes of acute sore throat. Removal of the tonsils in this patient seemed to be distinctly beneficial. In the case of the young girl with purpura, epistaxis, and pains in the extremities who was believed to have a rheumatic infection, the diagnosis was determined mostly by exclusion. This was a most unusual type of case, in that there was prolongation of the prothrombin time in the absence of other evidence of liver disease. Rheumatic fever was present in several members of the family and one brother now has a severe rheumatic infection. Detection of a friction rub led to the diagnosis of rheumatic fever in the child with purulent pericarditis, but pericardial tap revealed an exudate containing pus and staphylococci. Recovery followed

treatment with sulfapyridine. In the last of the 20 patients in whom the diagnosis of rheumatic fever was considered a possibility, the child had a hemolytic streptococcal infection; a loud cardiac murmur caused the diagnosis of rheumatic fever to be made.

Many other conditions exist which may present symptoms similar to those found in children suffering from various rheumatic infections. Some of these are rare. Meningococcemia may cause symptoms of polyarthritides and present a clinical picture simulating rheumatic fever. No such case was encountered during the time this study was made, although Dyson<sup>5</sup> recently had an example in which the findings so strongly suggested rheumatic fever that sulfonamide drugs were avoided until three weeks later when blood cultures revealed the causative organism. The response to chemotherapy was prompt, and recovery ensued. No children with undulant fever were seen during the time of this study.

Apparently, difficulty in differential diagnosis results chiefly from failure to recognize rheumatic infection in children. I recently reported<sup>6</sup> a review of the diagnoses made by admitting interns and practicing physicians in 271 children with rheumatic fever who were referred to the Department of Pediatrics of the University of Minnesota Hospital over a period of 12 years. There was agreement between the diagnoses made on admission and those finally made in two-thirds of the cases. In only 19 of the 96 cases with chorea minor was there not complete agreement in the diagnoses. Of especial interest are the remaining one-third, 90 cases of all types in which there was no agreement between the admitting and referring diagnoses. Of these, diagnoses could well have been made in 15 instances. The conditions causing confusion in making the correct diagnoses in the other 75 cases are outlined below without referring to the actual number of cases in each group.

- A. Nervousness, as a symptom of chorea minor
- B. Skin lesions, erythema, purpura
- C. Nephritis.
- D. Low grade infections
- E. Acute fulminating illness
- F. Osteomyelitis.
- G. Poliomyelitis.
- H. Appendicitis.

Chorea minor is readily diagnosed. However, it would appear that the diagnosis could well have been made earlier in the course of the disease in a number of instances. To detect evidence of the disturbed muscle tonus in the early stage of the disease and in the mild cases, we employ the procedure popularized by Dr. Irvine McQuarrie. Although a number of methods of examination are useful, this test seems to fit readily into the routine physical examination. The examiner places his hands, palms upward, in front of the patient, and the child while sitting comfortably is first requested to place his hands palms downward upon the hands of the examiner, then to place his tongue between his lips without touching the teeth. The subject is asked to sit as still as possible for a few moments. Even the six-year old child is able to remain very quiet under these conditions. One

may observe evidences of jerking of certain muscle groups, facial grimacing or feel the dystonia in the fingers. Evidence of weakness of muscle may be obtained by asking the child to grasp the fingers of the examiner and to hold firmly. The patient with chorea usually grasps firmly, loosens the hold, and grips tightly again, often with much gusto. Repeated use of the so-called finer tests soon acquaints one with normal responses. If the physician becomes suspicious of the reaction, he should inquire directly and indirectly of the mother for evidence of emotional instability or personality change in the patient. By the use of such procedure, many of the cases of chorea may be detected earlier and unsuspected mild cases may be brought to light.

There are other types of conditions which appeared to cause confusion in the diagnosis of rheumatic fever in the cases studied. Erythematous and purpuric skin lesions may occur in children with rheumatic fever, which may often be of value in arriving at the diagnosis. Albuminuria and microscopic hematuria may be found in acute rheumatic fever. Oftentimes other manifestations of the disease may be so mild that nephritis may be suspected. A real problem is found in those patients who have low grade rheumatic infection yet are not diagnosed as such. One must be aware of the fact that many patients with rheumatic fever, before they have a severe episode, will have a preceding history of such symptoms as slight anorexia, loss of or failure to gain in weight, weakness, personality change, easy fatigability, occasional epistaxis, pallor and mild pains in the muscles and joints. On the other hand, there are times when the patient with rheumatic fever is so acutely ill that he is suspected of having sepsis of some type. Often a case of carditis is diagnosed as "flu" or pneumonia from which recovery is slow. Under these conditions rheumatic fever should be suspected and the heart carefully examined. In this general group were six patients who were sent to the hospital with the diagnosis of subacute bacterial endocarditis, all of whom were actually suffering from severe rheumatic infection without this complication. Subacute bacterial endocarditis may occur in the child but far less frequently than in the adolescent or young adult. The fact that during the interval the study was made, four children were sent in with the diagnosis of poliomyelitis is significant. During the past two years a number of children have been referred to both the University Hospitals and the Minneapolis General Hospital because of possible poliomyelitis but they were actually suffering from acute rheumatic fever. We believe the reason for this is the apparent desire on the part of the physician or parent to obtain the Sister Kenny treatment being carried on at these institutions. Finally and most surprising in this series of cases, was the fact that appendicitis was frequently confused with rheumatic fever. In 25 per cent of the 75 cases in whom the diagnosis was missed, the presence of abdominal pain caused the diagnosis of appendicitis to be given or strongly suspected. Abdominal pain frequently occurs in patients suffering from rheumatic infections, but its appearance as the prominent symptom in so many instances was amazing.

On the basis of this study of case records in the Department of Pediatrics at the University of Minnesota, the conditions which most frequently must be considered from a practical point of view in the differential diagnosis of acute rheumatic infection in children are:

1. Appendicitis.
2. Poliomyelitis.
3. Osteomyelitis.
4. Acute glomerulonephritis.
5. Leukemia.
6. Hyperthyroidism.
7. Skin manifestation (erythema, purpura).
8. Evidences of low grade infection.
9. Acute fulminating infections, such as septicemia.

#### TREATMENT

The methods of treatment of acute rheumatic fever in children have shown very little change in the past few years. The most important single fact emphasized by many writers is that the sulfonamide drugs are ineffectual in the treatment of the active disease. The most significant effective measure is strict bed rest. Whether dealing with pain, choreiform movements, or cardiac decompensation, the treatment is symptomatic and in each case must be individualized. Of more interest in recent years is the matter of the prevention of recrudescence, which is perhaps the most characteristic feature of rheumatic infection. The physician must therefore assume responsibility for continuous care and advice for any patient who has suffered a rheumatic episode.

**Recognition of recurrence:** Not only should the physician be able to detect evidence of the recrudescence in its incipiency, but he should also acquaint the parents with the fact that it is likely to occur and should request that the parents bring the patient in for examination periodically whether or not any suspicious symptoms arise. Flare-ups of rheumatic fever are especially likely to occur following upper respiratory infection, such as a sore throat, scarlet fever, measles, varicella and rubella. Extensive studies have shown that continuous observation materially reduces the mortality of this disease.

**Nutritional and hygienic factors:** Patients who have suffered an attack of rheumatic fever should at all times be maintained on a complete nutritious diet (milk, meat, eggs, butter, vegetables, fruits, whole wheat or enriched cereals and breads, and cod liver oil or its equivalent in vitamins A and D and iron, if anemia is present). This must be done, even if it is necessary to request help from the rationing board or social agencies. Regular sleeping habits, preferably with an afternoon rest period, should be prescribed. Advice regarding the avoidance of fatigue, needless exposure to the elements or to infections and in the use of proper clothing should be given.

**Removal of foci of infection:** Removal of the tonsils and adenoids will not prevent further attacks of rheumatic fever, but, if indication for their removal exists independent of the rheumatic infection, the procedure should be done, and sulfonamide compounds used prophylactically during this time. Infections in the teeth and the sinuses should be eradicated.

**Change of climate:** There is considerable evidence that recurrences are less likely to develop, if the patient can

live in such localities as Southern Florida, Cuba or Puerto Rico, Arizona and Southern California. In most cases, however, moving to a more favorable climate is out of the question.

**Social and economic conditions:** At times, the physician in certain cases can make recommendations to relatives or social agencies to keep the patient in more favorable environmental conditions. If physicians assume full responsibility in regard to the rheumatic infections, they can help to prevent too great expansion in the direction of governmental control of those patients in the relatively less favored social and economic conditions.

**Sodium salicylate as a prophylactic agent:** Recently Coburn<sup>6</sup> of Columbia University has used sodium salicylate (4-6 gms. daily to adults and 2-4 gms. daily to children) to prevent recrudescences in certain subjects who have had rheumatic infections. If, at the time the patient suffers an acute upper respiratory infection, hemolytic streptococci Group A are cultured from the throat, salicylates are prescribed for use continuously for a period of one month. By so doing, according to this worker, the chances of a flare-up of the disease are greatly reduced. The matter of obtaining satisfactory throat cultures during each respiratory infection in children would be difficult in private practice, so that this type of prophylaxis may be more valuable in institutions.

**Sulfonamides in the prevention of recurrences:** A number of investigators have shown that recrudescences of rheumatic fever are far less likely to occur if one of the sulfonamide compounds is taken daily throughout the season (October to June) that recurrences usually develop. Most workers recommend sulfanilamide 10 grains (0.67 gms.) twice daily for this purpose, and almost uniformly favorable results are reported. If this type of therapy is to be used, the situation should be discussed

with the patient and the parents in order that they may understand the purpose of the procedure, to insure proper cooperation. The aim is to prevent a recurrence which may prove fatal or at least render additional damage to the heart. Absence of active rheumatic infection must be determined before the drug is used. It is well to begin with smaller doses, 5 grains (0.3 gms.) once or twice daily, and to check the hemoglobin, white cell count, differential white cell count and urine at bi-weekly or at least weekly intervals for the first three or four weeks. If toxicity to the drug is to develop it usually does so within the first two or three weeks. Levels of the drug in the blood should be determined if at all possible, 2 to 3 mg. per 100 cc. of blood being desirable. Knowledge of the levels of sulfanilamide helps to detect those patients who are not cooperating or are careless in taking the drug regularly. If leucopenia, neutropenia or anemia occurs, the drug should be discontinued. This type of regime will not prevent recurrences during the first two weeks. If signs of a flare-up should appear shortly after the use of the drug has been instituted it is presumptive that the rheumatic infection was still active. So far sulfanilamide prophylaxis seems to be the most practical of the measures employed to prevent recrudescences of rheumatic fever, but with it, the physician should keep the patient under observation at all times.

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## Third Annual Journal-Lancet Lecture

University of Minnesota  
Medical School

The Third Annual JOURNAL-LANCET Lecture in the Medical School of the University of Minnesota will be delivered by Professor Ernst Gellhorn, M.D., of the Medical School of the University of Illinois. The lecture will be delivered at 8 P. M., Wednesday, May 19, 1943, in the Amphitheater, Room 15, of the Medical Sciences Building of the University. Professor Gellhorn's subject will be "Experimental Studies on Conditioned Reactions and Their Implications for Medical Problems."

The 1943 JOURNAL-LANCET Lecturer has been Professor of Physiology at the University of Illinois since 1933. Prior to that time he held a similar post at the University of Oregon, and earlier at the University in Halle, Germany. He has been for eight years liaison Professor between the Departments of Psychiatry and Physiology, working under a Rockefeller Foundation

grant to the University of Illinois. His main field of investigation has been neurophysiology, with especial reference to clinical physiological problems. He is the author of many important original research papers, and several books, the last of which was published in 1942 and is entitled *Autonomic Regulations—Their Importance to Physiology and Psychiatry*.

Professor Gellhorn has made particularly important contributions to the study of specific physiological disorders in patients with nervous and mental diseases. He has been a pioneer in the endeavor to bring psychiatric problems into the scope of study by physiological methods.

The first JOURNAL-LANCET Lecturer was Dr. René Dubos, Professor of Comparative Pathology at Harvard University, and the second, Dr. Herald R. Cox of the United States Public Health Service.

# The Problems and Control of Dental Caries in Children

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**A**LMOST half of the first two million men examined under the present Selective Service Act were rejected because of physical defects. In commenting on this finding, Ciocco, Klein and Palmer state,<sup>1</sup> "Complacency about the Nation's health engendered in late years by emphasis on the declining mortality and the so-called increase in longevity received something of a shock recently when the results of physical examinations of selectees were made public. . . . The immediate reaction based on the exigencies of the moment has been to consider the 'rehabilitation' of men found defective. However, in keeping with the objectives of modern medical science it is appropriate to inquire into the possibilities of preventing the conditions which led to disqualification of men as soldiers." Since dental defects, the leading cause of rejection, was responsible for 20.9 per cent<sup>2</sup> of all rejections, and since the disease, dental caries, is the principal cause of dental defects in persons below age 35 years, it becomes of major importance to examine our present knowledge of the problem and control of dental caries.

The findings of several dental surveys<sup>3,4,5</sup> indicate that dental caries is the most prevalent chronic disease of children in the United States. The data in Tables I and II on the prevalence of dental caries in children of Nicollet County, Minnesota, were collected recently (1940-41) by the United States Public Health Service in cooperation with the Minnesota Department of Health. These data illustrate the common finding that more than 90 per cent of children aged 6 years have dental caries in the deciduous teeth and that more than 90 per cent of children aged 14 years have one or more carious permanent teeth. The average number of carious teeth per child for each age group indicates the manner in which carious defects accumulate with age.

Although the etiology of dental caries is not fully known, the chemicobacterial theory proposed by Miller<sup>6</sup> in 1887 is generally accepted as a broad fundamental description of the carious process. The theory holds that dental decay is a progressive decalcification of the enamel and dentin by lactic acid formed as a result of fermentation of carbohydrates. On the basis of this broad concept of the disease, four major methods for the prevention and control of dental caries have been advocated and promoted. These are: (1) oral hygiene, (2) nutrition, (3) restriction of carbohydrates in the diet, (4) interruption of the carious process by treatment with dental filling materials.

The first three of these represent preventive methods which have been promoted in this country for the past

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two or three decades. However, since available evidence<sup>3,4,5,7</sup> indicates that the incidence of dental caries has not decreased in this country, it is generally agreed that singly or in combination these preventive procedures have failed. Failure may have been due to basic defects in the methods or to deficiencies in their application. Considerable evidence has been accumulated in recent years which partially explains why these measures have not been successful in reducing the incidence of caries.

The oral hygiene method is founded on the assumption that caries is caused by acids formed by mouth organisms from foods adherent to tooth surfaces and therefore the process can be prevented by removing the substrate by proper use of the toothbrush. Although the sale and use of toothbrushes and tooth cleansing agents have increased tremendously, the expected reduction in dental decay has not yet been demonstrated. Recent findings of Fosdick and co-workers<sup>8</sup> have a significant bearing on this subject. These workers found that when free sugar was placed in an open cavity or in a so-called caries-susceptible area, the pH dropped to levels as low as 4.0 in three minutes. This fact, together with the finding that saliva or dissolved enamel neutralizes the acids in a comparatively short time, indicates that most of the damage to the tooth is done during or shortly after meals. In general the timing of the toothbrushing habit has not been in conformity with these observations.

The second method, nutrition, is based on a common approach to the prevention of many diseases, namely, increasing the resistance of the host. Since teeth are calcified structures, it seemed likely that resistance to decalcifying forces could be increased by fortifying the diet with calcifying elements for the proper formation of the teeth and for the maintenance of their integrity. Defective tooth structure may be produced in laboratory animals by feeding them on diets markedly deficient in one or more of the calcifying components, calcium, phosphorus, and vitamin D. Rigidly controlled experiments have failed to prove, however, that dental caries can be prevented by fortification of the diet.<sup>9,10,11,14</sup> Furthermore, studies<sup>12,13</sup> on population groups indicate that persons with evidence of gross deficiencies in nutrition, such as rickets and osteomalacia do not have more dental caries than other members of the same population groups who are without signs of dietary deficiency diseases.

The third method for the prevention of dental caries—restriction of carbohydrates in the diet—might be included under the discussion of nutrition. However, this method is concerned solely with an attempt to withhold from the diet the nutrient substance required by mouth organisms for the rapid production of acids. The work of Bunting and Jay<sup>14</sup> indicated that prevention of dental

caries by rigid restriction of carbohydrates in the diet is possible. Confirmatory evidence has been presented by several independent investigators.<sup>15,16</sup> Forces operating to render this method of caries prevention impractical can be noted from the fact, for example, that in the United States the annual consumption of sugar per person has shown a steady increase from 8 pounds in 1823 to 108 pounds in 1940.

Although we have not been successful in reducing the incidence of dental caries in children of this country by preventive measures, either because of basic defects in the methods or in their application, long clinical experience has established that the loss of teeth attacked by caries can be prevented or indefinitely postponed by proper treatment and placement of dental filling materials. Quantitative evidence presented recently supports the acknowledged effectiveness of this procedure for the prevention of tooth loss. For example, Nicollet County school children had slightly more carious permanent teeth than children in Hagerstown, Maryland, yet they had lost only half as many permanent teeth as the Hagerstown children. The only reasonable explanation of this reversal in the expected tooth mortality was the finding that Nicollet County children had approximately twice as many carious teeth filled as had Hagerstown children.<sup>17</sup>

Since this method of controlling dental caries and preventing tooth loss is based on early detection of the carious lesions and treatment with dental fillings, some concept of the size and nature of the job can be gained from a study of the prevalence figures presented in Tables I and II. The data in Table II indicate, for example, that the average number of carious permanent teeth per child increases relatively uniformly from 0.5 at age 6 years to 11.2 at age 18 years. The average child in Nicollet County is developing slightly less than one carious permanent tooth per year during the age span 6 to 18 years. A similar analysis of the data in Table I indicates that Nicollet County children develop slightly less than two carious deciduous teeth per year per child during the age span 2 to 6 years.

At present, then, the only known practical method of preventing tooth loss from dental caries is to have children's deciduous teeth examined and needed fillings placed at 2 years of age and at regular intervals thereafter until 10 to 12 years of age when exfoliation of the deciduous teeth is completed. Care of the permanent teeth should begin at age 6 and continue throughout life. This system is not only effective in preventing tooth loss but is far more economical than dental neglect which results in the loss of teeth and the need for elaborate and costly replacement appliances. Because of these facts the method has been called Protective Dentistry by Brekhus<sup>18</sup>—it does not prevent dental caries but protects against loss of teeth attacked by caries.

#### RELATION OF FLUORINE TO CONTROL OF CARIOSIS

A number of elements which produce toxic effects when ingested in large amounts are now known, through the feeding of highly purified diets, to be required in trace quantities for the nutrition of laboratory animals.

In the case of fluorine, three independent lines of evidence, two of which refer to the human, have been produced for the beneficial role of this element in the preservation of the integrity of the teeth. First, chemical analyses of the enamel of teeth which resist caries and those which succumb to decay; second, epidemiological surveys of the incidence of caries in children in relation to the amount of fluorine in communal water supplies; and third, demonstration that extra fluorine fed to rats inhibits the initiation of molar caries in this species under a variety of experimental conditions. In the light of recent evidence, it is now realized that observations with respect to the effect of fluorine on developing teeth have been recorded over a period of 40 years, but only since 1937 has the evidence warranted any conclusion other than that fluorine produced deleterious effects on the teeth.

McKay,<sup>19</sup> thoroughly described a condition of permanent teeth occurring in the Rocky Mountain regions characterized by mottling of the enamel with chalky white patches and frequent secondary discolorations ranging from yellow to brown. Eager, of the then U. S. Marine Hospital Service, first described this condition in 1902 when he noted its occurrence near Naples, Italy. In addition to foci in other countries, about 400 areas have since been located in the United States in which mottled enamel occurs endemically in varying degrees of severity.<sup>20</sup> McKay was able to demonstrate certain facts with reference to endemic mottled enamel which have been thoroughly confirmed, viz.: (a) only those children born in the community or who lived there from early infancy developed this condition, (b) children born in other regions and who moved to a region of endemic mottled enamel during the age period of enamel calcification developed the lesions on all teeth calcified after taking up residence in the second community, but those teeth calcified before residence in the endemic region were entirely normal and remained so, (c) the etiological factor responsible for the development of mottled enamel was associated with the communal water supply, (d) the etiological factor was commonly present only in water derived from deep wells or springs and was usually absent from surface water, and (e) mottled teeth were apparently no more susceptible or even less susceptible to decay than normal teeth. After the classical work of McKay 15 years elapsed before the presence of unusual quantities of fluorine in drinking water was indicated and proven to be the cause of mottled enamel.<sup>21,22</sup> It has now been established through the work of Dean and associates<sup>23</sup> that the concentration of fluorine in drinking water required for the production of a mild degree of mottled enamel in 10 per cent of the children who use the drinking water continuously from early infancy is 1.0 mg. per liter (1.0 p.p.m.).

From 1931 to 1937 fluorine was almost universally regarded as an undesirable constituent of communal waters since mottled enamel is unesthetic and, when the condition is severe, the teeth are structurally inferior. Several communities in which mottled enamel occurred changed the source of the common water supply to one of a lower fluorine content with the result that mottled enamel

failed to appear in the permanent teeth of the children born subsequently to the introduction of the new drinking water. However, as mentioned above, there is now strong circumstantial and direct evidence that optimum quantities of fluorine ingested during the period of enamel calcification confers upon the teeth a lasting and considerable degree of increased resistance to caries.

Armstrong and Breckhus whose data<sup>24</sup> are quoted in Table III found no significant difference in the composition of the enamel of sound teeth and that of carious teeth with respect to calcium, phosphorus, magnesium and carbonate. The same workers in a later publication<sup>25</sup> demonstrated (see lower line of Table III) that a positive relationship exists between the fluorine content of enamel and the resistance of teeth to caries. It is unlikely that the lower fluorine content of the enamel of the carious teeth is a secondary effect of the carious process since no such result was produced by caries in the case of the other constituents of enamel. The enamel of the very severely mottled teeth of a woman who had lived for the first nineteen years of her life in a region of endemic mottled enamel were found to contain 0.033 to 0.036 per cent fluorine.<sup>26</sup> This amount is about three times that present in the enamel of the average sound non-mottled tooth. These results demonstrate that relatively small quantities of fluorine in enamel produces, or is accompanied by, profound changes in the character of the enamel. Since the woman had lived in Minneapolis for the twenty years preceding the extraction of her teeth, the results also indicated that fluorine once combined in enamel structure is not susceptible of appreciable reduction.

The inhabitants of the Island of Tristan da Cunha which lies in the South Atlantic Ocean have long been known to be unusually free from dental caries. The cause of this remarkable condition, until recently, had been uncertain. About six years ago, Dr. Reider F. Sognnaes visited this island as a member of a Norwegian expedition. He obtained a number of sound exfoliated deciduous crowns and a few permanent teeth, most of the latter being carious. The enamel and dentin of these teeth were subjected to fluorine analysis<sup>27</sup> with the results summarized in Table IV. The significant finding was the relatively high fluorine content found in the enamel of both the deciduous and permanent teeth as compared with the results obtained with specimens collected in Minnesota. Furthermore, the fluorine content of the dentin of the Tristianites was considerably higher than that of Minnesotans. All of these facts served to indicate that the Tristianites continued to ingest throughout life an unusually high amount of fluorine. It thus appeared that Tristan da Cunha was yet another locality in which the inhabitants were accidentally receiving during the period of active tooth formation about the optimum quantity of fluorine for the preservation of the integrity of their teeth. This conclusion was strengthened by the clinical observations made by Dr. Sognnaes, who noted that about 16 per cent of the Tristianites displayed very mildly mottled enamel.<sup>28</sup>

Mention has been made that there had been some suspicion in the minds of dentists who saw mottled

enamel that such teeth may be more resistant to caries than teeth not so affected. Dr. H. Trendley Dean and his collaborators of the United States Public Health Service have compiled evidence which amounts to an almost certain demonstration that such is the case. Dean and his co-workers have also shown that the teeth of persons who throughout childhood ingested drinking water containing exceptional amounts of fluorine definitely gained in caries resistance irrespective of whether the teeth were mottle. These investigations have furnished the second line of evidence in support of the beneficial role of fluorine.

Table V shows the results of a study made by Dean's group in Wisconsin.<sup>29</sup> Note the unusually low incidence of dental decay observed in Green Bay as compared with seven other towns and cities in Wisconsin. Note also that the water supply of Green Bay contained much more fluorine than was found in the public water of the other communities.

Two other similar, but more thorough studies, were carried out in Illinois. The results of these investigations are shown in Table VI. Only those children who had used their local communal water supplies throughout life, thirty calendar days in any one year excepted, were included in the final tabulation. The first of these compared the caries incidence in Galesburg, Monmouth, Macomb, and Quincy.<sup>30</sup> Observe the very much lower incidence of caries found in Galesburg and in Monmouth as compared to the incidence of this disease in Macomb and Quincy. A much larger proportion of the children were caries-free in the two towns whose communal water supplies contained respectively 1.8 and 1.7 p.p.m. of fluorine. The amount of fluorine found in the drinking water of Macomb and Quincy, 0.2 p.p.m., was very close to the quantity found in Minneapolis city water.

In a more recent investigation the dental caries experiences observed in eight towns near Chicago were compared.<sup>31</sup> These results are shown on the lower part of Table VI. The water of Evanston, Oak Park, and Waukegan was obtained from Lake Michigan and was reported to contain no fluorine. In the other five towns beginning with Elmhurst, the water was obtained from deep wells and contained unusual quantities of fluorine. The caries incidence observed in Elmhurst, Maywood, Aurora, and Joliet was very low—namely, 252 to 323 caries per 100 children. These caries attack rates were less than one-half those seen in the towns whose public water supplies contained no fluorine. The localities characterized by a low caries incidence were those where public water supplies contained 1.2 p.p.m. or more of fluorine. A more recent study<sup>32</sup> by the Public Health Service workers was a re-examination of the teeth of residents of Bauxite, Arkansas, who, as children, drank a high fluorine water. Twelve years after the water supply was changed to a nearly fluorine-free source, the teeth of the persons just mentioned were found to have developed fewer caries than either those of persons who were never exposed to high concentrations of fluorine or those of children born in Bauxite since the water supply was changed.

Day<sup>32</sup> in India, and Wilson<sup>31</sup> in England, have also noted a decreased incidence of caries in regions characterized by high fluorine content in the drinking water. The low caries attack rate in Deaf Smith County, Texas, has recently attracted considerable attention in the public press. The water in this county contains 2.2 to 2.7 p.p.m. of fluorine. McClendon<sup>33</sup> has very recently produced data which led to the conclusion that dental caries varies inversely with the fluorine content of cow's milk.

The third line of evidence indicating that fluorine promotes resistance to dental decay has been derived from studies in experimental animals. Space will not permit a description of the significance of caries in rat molar teeth or an exposition of the details of these experiments. Several investigators in other laboratories demonstrated that the addition of relatively large quantities of fluorine to a dietary regime which was known to produce caries of rat molar teeth greatly reduced the incidence of such lesions below the number which appeared in the teeth of control

cation of fairly strong solutions of sodium fluoride to the teeth. The same conclusion had already been reached by Volker and co-workers.<sup>34</sup> The evidence which we have at hand indicates that the topical application of fluoride solutions to the teeth would be an entirely safe procedure if carried out in a systematic manner by dental

TABLE I

Percent of Children with 1 or more Carious (Decayed or Filled) Deciduous Teeth and Average Number of Carious Deciduous Teeth per Child, by Age, for 664 Children, Nicollet County, Minnesota.												
Age last birthday	0	1	2	3	4	5	6	7	8	9	10	11
Number of children	7	43	36	61	83	106	268					
Percent of children with												
1 or more carious deciduous teeth	0.0	4.6	13.9	39.0	66.3	74.1	91.4					
Average number of carious deciduous teeth per child	0.0	0.4	0.5	2.5	4.1	5.4	7.5					

TABLE II

Percent of Children with 1 or More Carious (Decayed, Missing or Filled) Permanent Teeth and Average Number of Carious Permanent Teeth per Child, by Age, for 2,627 School Children, Nicollet County, Minnesota														
Age last birthday	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Number of children	239	252	276	282	276	265	289	231	159	142	93	79	24	
Percent of children with 1 or more carious permanent teeth	24.3	53.6	75.7	84.0	86.2	89.8	92.7	95.2	94.5	98.6	97.8	93.7	100.0	
Average number of carious permanent teeth per child	0.5	1.4	2.3	2.8	3.4	4.2	5.5	6.3	7.7	9.6	9.6	10.8	11.2	

animals not receiving the extra fluorine. Recently Dr. Rudolph Norvold carried out in our laboratory a well-controlled study in which he demonstrated the positive effect of fluorine in reducing the initiation of rat molar caries under three conditions.<sup>35</sup> These three conditions were: (1) when extra fluorine was supplied to the animals only during the stage of tooth formation, and before the animals were put on the caries-producing diet; (2) when the extra fluorine was supplied to the animals concurrently with a caries-producing food; and (3) when the fluorine was given in high concentration in drinking water to mature rats for a period preceding, but not during the caries-producing regimen.

What application of these facts can be made to the reduction of dental caries in the human? One obvious way would be to treat public water supplies with fluorine to the extent that the product should contain 1.0 p.p.m. of fluorine. Probably this method could be employed with safety if carried out under rigid control. However, the water intake of individuals varies and the intake in warmer climates is higher than in the cooler climates. There is some risk, until evidence to the contrary is produced, that the addition of fluorine to communal water supplies might cause toxic results. Furthermore, any benefit to be derived from this procedure would accrue only to those persons who use the high fluoride water during the time of the formation of their teeth.

An accidental observation which we made in connection with another investigation<sup>37</sup> has indicated that the fluorine content of the enamel of fully formed, erupted teeth of rats can be increased by a relatively brief appli-

TABLE III

Composition of Enamel of Sound and Carious Teeth			
	Enamel—Sound Teeth		
	Mean Per Cent	Standard Deviation Per Cent	Number of Analyses
Calcium	39.35	0.977	41
Phosphorus	17.43	0.360	41
Magnesium	0.10	0.041	14
Carbonate—(CO <sub>2</sub> )	3.00	0.187	41
Fluorine	0.0111	0.0020	50

	Enamel—Carious Teeth		
Calcium	35.63	0.638	15
Phosphorus	17.21	0.145	15
Magnesium	0.32	0.026	15
Carbonate—(CO <sub>2</sub> )	3.01	0.129	14
Fluorine	0.0069	0.0011	30

TABLE IV

Fluorine Content of Enamel and Dentin of Teeth from Tristan Da Cunha and Minnesota			
	Tristan Da Cunha	Enamel Per Cent	Dentin Per Cent
10 Deciduous teeth, caries-free		0.0140	0.0196
8 Permanent teeth		0.0140	0.0270
Minnesota			
3 Deciduous teeth		0.0072	
50 Sound permanent teeth		0.0111	0.0163
30 Carious permanent teeth		0.0069	0.0163
2 Mildly mottled permanent teeth		0.0248	0.0393

TABLE V

Dental Caries Attack Rates in Permanent Teeth in White Children Aged 12 to 14 Years

City	Number of Children	Number of Carious Teeth per 100 Children	Fluorine Content of Water Supply p.p.m.
Green Bay	687	275	2.3
Sheboygan	244	710	0.5
Manitowoc	661	682	0.35
Two Rivers	382	646	0.3
Milwaukee	2,645	917	0.3
West Allis	160	831	0.3
Baraboo	119	733	0.2
La Crosse	47	731	0.12

TABLE VI

Dental Caries Experience in Children Aged 12 to 14 Years

City	Number of Children	Caries per 100 Children	Percent Children Caries-Free	Fluorine Content of Water p.p.m.
Galesburg	319	201	35	1.8
Monmouth	148	205	35	1.7
Macomb	112	401	14	0.2
Quincy	306	633	4	0.2
Elmhurst	170	252	25.3	1.8
Maywood	171	238	29.8	1.2
Aurora	633	281	23.5	1.2
Joliet	447	323	18.3	1.3
Elgin	403	444	11.4	0.5
Evanston	256	673	3.9	0.0
Oak Park	329	722	4.3	0.0
Waukegan	423	810	3.1	0.0

practitioners. It must be demonstrated, however, whether fluorine introduced into the teeth in this manner is effective in reducing the caries susceptibility of the teeth. This effect can be proven only by a well-controlled experiment employing children as the subjects. Bibby has made two reports<sup>39</sup> and Cheyne a single report<sup>40</sup> of success in reducing the caries attack rate in children by the use of this method. We have at present 300 school children in Arlington, North Mankato and St. Louis Park, Minnesota, whose teeth received in May, 1942, up to 16 topical treatments with sodium fluoride. We believe that the number of cases and treatments employed in this study will permit a definite assessment of the practical value of this procedure as a means of control of dental caries.

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# Chronic Constrictive Pericarditis

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**T**HE pericardium may be involved in various pathological processes, but in children, pericarditis is most often associated with rheumatic fever. Peculiarly, however, rheumatic fever seldom gives rise to scarring of the pericardium to such an extent that it causes obstruction to the heart. In fact, the etiology of the typical syndrome produced by chronic obstructive or constrictive pericarditis is often obscure. This condition, although not very common, is occasionally seen in children. A recent fatal case which we encountered in an eleven year old boy is the basis of this report.

C. K., an 11 year old white male was admitted to Charity Hospital on June 6, 1942.

**History.** In February, 1942, the patient experienced generalized body aches, cough, increased sweating, poor appetite, and began to lose weight. He was treated by his family physician for "influenza" and improved in about two weeks but did not recover completely. The poor appetite persisted and he failed to regain the weight lost during his illness. During convalescence his physician told the family that he had "heart trouble." In March, 1942, the patient vomited frequently for a period of one week. At that time his physician noted an enlarged liver, ascites, and fluid in the right chest, in addition to edema of the lower extremities and face. In May, 1942, the patient became quite dyspneic and fluid was removed from his chest. He seemed to become worse after this and had to be placed in an oxygen tent. Later a paracentesis was done and a clear straw-colored fluid was removed. The patient was then referred to Charity Hospital, the physician believing that the patient had some form of malignancy.

**Past History.** The patient had always been anemic and weak but especially so during the past four years. He contracted pertussis and measles during infancy and typhoid fever in 1938. Tonsillectomy was done at the age of six.

**Physical Findings.** On admission the patient was undernourished, pale and weak. Edema was present on the face and lower extremities. Ascites was a prominent feature. The neck veins were distended and pulsating. The abdominal veins were noticeable. The heart revealed nothing abnormal by auscultation except for an increased rate of 125 per minute. The liver was markedly enlarged, extending down 6 cm. in the region of the right lobe anteriorly and 7 cm. over the left lobe. It was smooth and rather firm to palpation. The spleen was not palpable. The right chest showed diminished excursion and bulging of the interspaces. Tactile fremitus and resonance were diminished over the right chest. Flatness to percussion was also elicited over this same area. The blood pressure was 110/90.

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Fig. 1. Gross dissection of heart, lungs and pleura. Note extensive thickening of the pleura as well as the pericardium.

**Laboratory Studies:** Blood studies showed a hemoglobin of 60 per cent of normal, red blood cell count 5.1 million, white blood cell count 18,000, 60 per cent polymorphonuclear cells, 23 per cent lymphocytes, 11 per cent monocytes, 2.5 per cent eosinophils, and 2 per cent basophils. Urinalysis revealed normal findings. Tuberculin test 1:10,000 to 1:10 was negative. Blood urea was 8.3 mg. per 100 cc., total protein 6.2 grams per 100 cc., with albumin 3.2 grams and globulin 2.95 grams. Wassermann test was negative, blood glucose 103 mg. per 100 cc., and stools were normal. The phenolsulfonaphthalein test showed 60 per cent return in two hours. X-ray studies revealed the left chest to be clear. The right pleural cavity contained air and fluid, the fluid extending to the level of the fourth rib anteriorly. The right pleura was thickened, and the right lung was atelectatic. Repeated fluoroscopic examinations revealed a heart of normal size, with diminished pulsations of all borders of the heart. Intravenous and retrograde pyelograms revealed the kidneys normal. The skull and long bones appeared normal on x-ray studies. The saccharin circulation time was 27 seconds. The venous pressure was 240-270 mm. of water. Kidney and liver function tests were normal. Electrocardiogram showed slight right axis deviation, inversion of the T-waves in all leads, sinus tachycardia, and occasional ventricular premature beats. Repeated examinations of the sputa, abdominal, and pleural fluids for tubercle bacilli were negative by smear, culture, and guinea pig inoculations.

**Hospital Course.** Thoracentesis was done soon after admission, and about 100 cc. of clear straw-colored fluid was obtained. Repeated thoracentesis was done subsequently with the same findings. Cultures of the fluid revealed no growth. Smears from the sediment showed large macrophages filled with fat droplets. Repeated paracentesis of the abdomen revealed a similar straw-colored fluid, which on culture revealed no growth. Edema of the lower extremities and face disappeared after the removal of the ascitic fluid. On August 12,



FIG. 2. Gross appearance of heart, pericardium and liver. Anterior surface of heart successfully freed of adhesions by operation. Liver enlarged.

1942, an operation was performed. The pleura and pericardium were thickened and presented many adhesions. Approximately half of the pericardium over the anterior portion of the heart was removed. About twenty-eight hours after the operation the patient became markedly dyspneic. The pulse was weak and the skin clammy. Examination suggested atelectasis of the left lung. A thoracentesis was done in the left posterior interspace but only air was obtained. Another thoracentesis was done anteriorly at the site of the incision, and air and about 80 cc. of straw-colored fluid were obtained. One and a half hours after the second thoracentesis, or thirty-four hours after operation, the patient died.

*Pathologic Observations.* There was marked thickening of the pleura bilaterally but more extensively on the right side. There were some adhesions between the pleura and the chest wall. On the right side, there was a large empyema cavity filled with thick fibrinous material. (See Figure 1).

The mediastinal structures were densely bound down by adhesions. Both the parietal and visceral pericardium was markedly thickened, completely encasing the heart except over a small area anteriorly where surgical excision was carried out. The liver was markedly enlarged and congested. (See Figure 2).

#### DISCUSSION

*History.* The first clinical description of the disease is attributed to Richard Lower.<sup>1</sup> Subsequently, various authors recognized and adequately described the clinical signs, symptoms and pathogenesis of chronic constrictive pericarditis: Chevers,<sup>2</sup> Wilks,<sup>3</sup> Pick,<sup>4</sup> Kussmaul,<sup>5</sup> and Volhardt and Schmieden.<sup>6</sup>

The surgical procedure of pericardiectomy was first

suggested by two Frenchmen, Weill<sup>7</sup> and Delorme,<sup>8</sup> but was first carried out by Rehn<sup>9</sup> and Hallopeau.<sup>10</sup> The first successful operation for constrictive pericarditis in America was reported by Churchill.<sup>11</sup> Later Beck,<sup>12</sup> Burwell,<sup>13</sup> and others claimed similar successes. Prior to the recommendation for decortication, Bruer<sup>14</sup> suggested cardiolysis, a procedure consisting of the removal of pre-cordial bony structures so the tug of the heart would be on the soft structures instead of on the bony chest wall. This operation, however, has been found to be ineffective in chronic constrictive pericarditis.

*Etiology.* The etiology is usually obscure, as in our case. Some cases are apparently due to tuberculous infection while others are secondary to respiratory infections. Rheumatic fever is not a primary factor.

*Clinical Manifestations.* For the sake of brevity, the important clinical manifestations will be tabulated in outline form:

1. Loss of weight, weakness, easy fatigability.
2. Dyspnea on exertion.
3. Epigastric distress and anorexia.
4. Slight anemia and decreased blood proteins.
5. Normal temperature.
6. Faint heart sounds, no murmurs.
7. Heart of normal size or small.
8. On fluoroscopy, decreased pulsations of heart borders especially on the right side.
9. Tachycardia especially on exertion.
10. Paradoxical pulse, thready during inspiration.
11. Blood volume increased 30 to 40 per cent above normal.
12. Cardiac output diminished.
13. Circulation time delayed.
14. Venous pressure consistently high.
15. Dilatation of jugular veins with or without pulsations.
16. Systolic pressure low, usually 100-110, diastolic pressure normal or elevated, usually 80.
17. Pulse pressure diminished, usually 20.
18. Electrocardiogram shows low voltage, inversion or flattening of the T-waves in two or more leads.
19. Calcified plaques in pericardium seen in 20 per cent on x-ray.
20. Ascites usually precedes edema of face and extremities by several weeks or months.
21. Liver markedly enlarged.
22. Impairment of liver function.
23. Pleural effusion.
24. Triad of Beck: Small quiet heart, venous hypertension, ascites and enlarged liver.

*Pathogenesis.* The symptoms of chronic constrictive pericarditis can be explained on the basis of obstruction arising from compression exerted by the constricting scar tissue. Beck<sup>12</sup> has experimentally determined that the significant point in the obstruction is the thickening of the pericardium and not necessarily the adhesions between the heart and pericardium. Cardiac failure arises because of the inability of the heart to hold, in diastole, sufficient blood to maintain an adequate arterial circulation. The cardiac output is thus diminished and the blood is dammed back into the venous and arterial beds, increasing the blood volume. The heart tries to compensate by increasing its rate but this attempt is limited. Hypertrophy and dilatation of the heart are limited by the thick encircling scar tissue around it, causing the patient to complain of weakness, easy fatigability, and dyspnea on exertion.

As decompensation increases, the blood begins to pile

up in the vena cava and dam back into the systemic veins. The venous pressure increases, its height giving an index of the severity of the cardiac compression. The systemic veins although bearing a tremendous back pressure can stand it far better than the hepatic veins which are without valves. The liver thus suffers from a portal decompensation, becoming large, tender, and congested. With continued back pressure, liver damage occurs, leading ultimately to cirrhosis if the patient survives long enough. Portal decompensation gives rise to ascites.

As the pathologic process continues, generalized edema results from venous stasis. Pleural effusion can similarly be attributed to venous congestion of the parietal pleura.

The high degree of obstruction to the heart produced by the constricting scar tissue is possible only because the pathogenesis arises slowly. The greatest compression force noted by Beck<sup>12</sup> was from 40 to 45 cm. of water. Beck has observed that an acute compression pressure of 15 to 20 cm. of water will be fatal. In our case, it is difficult to determine what part the empyema in the tight pleural cavity played in the etiology of the pericarditis. It is possible that a pneumonia and empyema antedated the process in the pericardium.

**Surgical Considerations.** Operative intervention consists essentially in extrapleural exposure of the heart, and release of the constricting membranes in a one-stage operation. It is important to free the apex of the heart, when adherent to the diaphragmatic surface, and to remove the scar from the left ventricle, first because of danger of dilatation of right ventricle if excision is started on the right side.

**Preoperative Treatment.** Preoperative treatment consists in external heat before, during, and after operation.

The fluid from the abdomen and chest should be aspirated before operation is performed. Anemia and malnutrition should be corrected by transfusions and a high caloric diet.

**Postoperative Care.** Postoperative care includes continued oxygen therapy and limitation of fluids. Intravenous fluids should be given with caution because of the severe, sudden strain thrown on the heart, incident to the operative procedure.

#### SUMMARY

A fatal case of chronic constrictive pericarditis occurring in an eleven year old boy is reported. The pathologic observations and a discussion of the disease are briefly presented.

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## The Early Diagnosis of Poliomyelitis

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RECENT interest in the Kenny treatment of poliomyelitis has made the early diagnosis of the disease most important. Miss Kenny has repeatedly stated that the more quickly her treatment is instituted, the shorter the period of special care, and the better the results. Much has been written concerning the diagnosis of infantile paralysis, but many practitioners still do not have a clear clinical picture of the disease during the acute period. A careful study of the records of 259 acute cases admitted to the Minneapolis General Hospital during the past six years has revealed the early symptoms and signs listed in Table I and offered a rather simple description of infantile paralysis. The majority of the patients were children ranging in age from 1 to 14 years with the highest incidence appearing between 5 and 9 years. Starting with a few cases in July of each year, there was a rapid increase in the number until the peak was reached in September, following which there

was a gradual decline for the next three or four months. The number of patients varied greatly from year to year.

The early symptoms of poliomyelitis may not indicate that the disease is present. Usually the first sign is fever which averages 101° F., but may be as high as 104° F. After the fever has been present for a short period of time, patients complain of headache of moderate severity but with no characteristic localization, since it may be frontal, lateral, or occipital. Nausea and vomiting occur indicating a gastro-intestinal upset. The patient becomes restless and irritable. This completes the initial phase, and only a suspicion of infantile paralysis exists.

The disease progresses into a second phase which may reveal that the child has poliomyelitis. The headache becomes more severe and the nausea and vomiting disappear to be followed by constipation. Stiffness of the neck and pain on flexion of the neck and spine appear. The patient is unable to touch the knee with his head owing to the spasm of the spine muscles. Pain becomes more extensive and severe. It is not located in the skin but

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essentially in the muscles of the extremities which still may be moved by the child.

Soon the severity of the headache lessens. Drowsiness develops. The patient now makes little or no effort to move certain groups of muscles. Close inspection of these muscles reveals that they are painful, tender, irritable, shortened, and firm, indicating spasm. The principal locations of the demonstrable muscle spasm are the back, posterior neck, thigh, and calf of leg. The pectoral, quadriceps and biceps muscles and muscles of respiration are also frequently involved. This situation is the most characteristic feature of the disease and represents the third phase. Further examinations of the child should be limited since they can aggravate the spasm, thereby retarding treatment which must be started immediately.

If all the cases of infantile paralysis would follow the course described, the diagnosis would not be difficult. However, there are patients who have a slight rise in temperature, a mild headache, and then, in a very short period of time, they develop rigidity of the neck, marked pain on motion of the back, and loss of function in some of the muscles of the extremities. A positive Kernig's sign may be present. These cases are referred to as having the meningeal type of onset.

Occasionally the disease progresses rapidly to stupor, prostration or delirium. This is the cerebral form of poliomyelitis (also called the Strümpell type).

Almost as frequent as the meningeal type of onset is the one which ushers in the disease with marked gastro-intestinal symptoms. Following the initial spell of nausea and vomiting, the child complains of a generalized abdominal pain with or without tenderness. If the former is present a spasm of the recti muscles may be detected. Diarrhea can occur and usually is not severe, but in a few cases it has caused prostration. The diagnosis of infantile paralysis often is not established until the characteristic spasm appears in the muscles of the trunk and extremities.

Another group of patients has the symptoms and signs of an acute attack of coryza which may lead on to acute pharyngitis or tonsillitis with fever and headache. The upper respiratory infection continues for a few days or for as long as a week before it subsides. Then the headache usually becomes more severe and stiffness of the neck appears, frequently followed rather quickly by pain on flexion of the neck and the spine. In spite of the latter signs of poliomyelitis, the diagnosis of the disease is uncertain. It is not until the respiratory infection has disappeared almost completely that the remaining physical findings warrant a more definite diagnosis of infantile paralysis.

In the majority of the cases the course of the disease is progressive with the patient passing from one phase to the next. However, in about one-fourth of the children there is an initial phase of general systemic symptoms such as fever, headache, nausea and vomiting, with or without any evidence of an upper respiratory infection. Improvement appears but after a period of two to seven days, the fever returns, often rising to a high level. The headache becomes more severe and the disease progresses rapidly to the final phase with widespread muscle involve-

ment. This diphasic type of course is sometimes called the "dromedary" type.

An examination of the spinal fluid cannot be neglected as an aid in the diagnosis of poliomyelitis. If the fluid is collected during the first phase of the disease, it may reveal little. No cells or only a small number are found, usually all polymorphonuclear cells. During the second phase, the spinal fluid cell count increases and has risen as high as 1000 although the average range is between 50 and 150. The shift is to the mononuclear cells, and during the third phase of the disease, the majority of the cells are lymphocytes. Soon after this, the count may drop rapidly to zero even though extension of the loss in muscle function has not ceased.

The spinal fluid sugar level changes little, always being close to 60 milligrams per 100 cc. of fluid. Even in the more severe cases there is only an insignificant elevation. During the first and second phases the protein content of the spinal fluid is usually around the normal level of 40 milligrams per 100 cc. of fluid, but in the final phase of the acute period of infantile paralysis it may rise to 80 milligrams or slightly higher in the more severe cases. The delayed rise in the spinal fluid protein is often too late to assist greatly in the early diagnosis of the disease.

During the period of seasonal prevalence and especially if the disease is epidemic, the advantages of an early recognition of poliomyelitis lead the practitioner to make a tentative diagnosis of that disease at the onset of many illnesses which are not infantile paralysis. At the Minneapolis General Hospital one out of every six cases admitted as poliomyelitis proved to be another disease. Table II reveals that upper respiratory infections, meningitis, Guillain-Barre syndrome, pneumonia, encephalitis, and rheumatic fever head the list of diseases which have been incorrectly diagnosed as infantile paralysis. The reason for this is that these diseases have simulated the different clinical pictures produced by the variation in severity of the early symptoms and signs.

Acute upper respiratory infections with fever, headache, nausea, vomiting, and restlessness appearing in autumn frequently can be diagnosed as the onset of poliomyelitis. If no loss in muscle function occurs and a spinal fluid examination is normal, the diagnosis may be dropped. Some of the patients are referred to as having abortive type of infantile paralysis, but there is no way at the present time to prove that this diagnosis is correct. However, with the more careful inspection of the children by the Kenny method, a few of the cases are considered poliomyelitis since muscle spasm is demonstrated. Furthermore, repeated spinal puncture often reveals in these patients the characteristic pathologic changes in the spinal fluid in spite of the fact that the first examination is normal.

Meningitis may easily be confused with infantile paralysis chiefly because the latter can have a rather insignificant onset to be followed by the sudden development of meningeal symptoms such as a severe headache and stiffness of the neck. The rigid neck of meningitis does not relax while that of poliomyelitis is more or less a voluntary mobilization of the neck muscles which can be overcome by moderate and constant resistance on the part of

the examiner. The examination of the spinal fluid is most important as a means of differential diagnosis. The bacteriologic study should not be omitted. The cell count in meningitis is much higher than in infantile paralysis and the polymorphonuclear cells predominate throughout the course of the disease. The only exception is tuberculous meningitis in which the onset is insidious and usually accompanied by other evidence of tuberculosis.

Occasionally a rather mild pharyngitis or tonsillitis will be followed by a symmetrical and bilateral loss of muscle function in the extremities. The latter condition may appear suddenly or it may extend over a period of weeks or months. The proximal muscle groups are more severely involved than the distal. Hyperesthesia to superficial touch is more annoying to the child than muscle pain. Although poliomyelitis is considered, this diagnosis is questioned because the motor impairment does not have the localized and asymmetric distribution noted frequently in infantile paralysis. Furthermore, the hyperesthesia is more prominent than that usually observed in poliomyelitis. The clinical picture resembles that of infectious polyneuritis or the Guillain-Barre syndrome, the diagnosis of which can be made more certain by examination of the spinal fluid. The cell count is low, ranging from a few cells to 50 throughout the course of the disease. The majority of the cells are always lymphocytes. The protein content is high, the average range being between 100 and 300 milligrams per cent.

The onset of pneumococcus pneumonia in young children can simulate infantile paralysis. This is especially true if an upper respiratory infection with symptoms resembling those of the initial phase of poliomyelitis is present just before the patient has a sudden rise in temperature to 104° F. followed by stupor, prostration or delirium. Rigidity of the neck appears, but there is little or no pain on passive motion of the neck or spine. The characteristic muscle pain of poliomyelitis cannot be demonstrated. Convulsions are common, and they are rare in infantile paralysis. Further examination usually reveals the characteristic lung findings of pneumonia and the roentgenogram confirms the diagnosis. Nevertheless, a spinal puncture is indicated. The fluid is under increased tension; as a rule there are no bacteria; and there is either a slight increase in cells and protein, or none at all.

Encephalitis may be confused with the cerebral type of poliomyelitis when the latter progresses rapidly to the third phase and leads to extreme drowsiness. However, the drowsiness of encephalitis is much more profound than that of infantile paralysis; once the patient with poliomyelitis is aroused he is quite alert. The spinal fluid reveals an early, moderate increase in cells. An occasional case of encephalitis may have a spinal fluid cell count as high as 200, mostly lymphocytes. The polymorphonuclear cells never predominate. There is little or no increase in the protein content of the spinal fluid.

An acute attack of rheumatic fever with irregular distribution of joint involvement and pain referred in part to the adjacent areas of the extremities may be inaccurately diagnosed as infantile paralysis, especially when the rheumatic infection appears during the season when poliomyelitis is prevalent. The child

with rheumatic fever may not move the extremities on account of the severity of the pain, but this immobilization is voluntary. No muscle spasm develops, and with new methods of demonstration this absence is significant in indicating that the disease is not infantile paralysis. The sedimentation rate usually is increased and the spinal fluid remains normal. There is a good response to salicylate which never occurs in poliomyelitis.

One-fourth of the cases studied had difficulty in swallowing or in breathing or both. In these patients the course of the disease is gradual through the various phases leading to regurgitation of fluids through the nose, accumulation of mucus in the pharynx, and a weak cough. Occasionally the infection is quite fulminating in character with the early symptoms signs and loss of muscle function being synchronous. The diagnosis is not difficult whenever muscle spasm can be demonstrated in the extremities or back, and the spinal fluid has the characteristic abnormalities of poliomyelitis already described.

#### SUMMARY

The early diagnosis of infantile paralysis now is essential since the Kenny method of treatment gives the best results when it can be instituted as soon as muscle spasm appears.

To aid in the diagnosis, 259 cases of poliomyelitis admitted to Minneapolis General Hospital were reviewed and from a tabulation of the early symptoms and signs, the average course of the disease was found to fall into the following phases:

Phase 1—fever, headache, nausea and vomiting, restlessness or irritability.

Phase 2—headache continues, stiff neck, pain on flexion of neck or spine, muscle spasm especially on motion.

Phase 3—pain on flexion of neck and spine continues, drowsiness, muscle spasm and no motion.

Spinal fluid examination during the second and third phases usually reveals the characteristic changes which may confirm the diagnosis. Therefore this diagnostic procedure should not be omitted.

Some of the symptoms and signs may be more severe in one case than another and lead to various types of onset—meningeal or cerebral, gastro-intestinal, and respiratory.

Many diseases have been confused with infantile paralysis, chiefly because some of their symptoms have been exaggerated to the extent that they resemble the characteristic features of the various types of poliomyelitis.

The more careful inspection and palpation of the muscles as recommended by Miss Kenny reveal muscle spasms early in infantile paralysis and save the parent a great deal of suffering by shortening the period during which a definite diagnosis is made.

TABLE I  
Early Symptomatology in 259 Cases of Infantile Paralysis  
Minneapolis General Hospital 1937 to 1942 inclusive

No. Symptoms and Signs	No. Cases	No. Symptoms and Signs	No. Cases
Fever and malaise	220	Difficulty in swallowing	15
Headache	210	Sonor, prostration	15
Grip or rigid neck	177	Difficulty in breathing	11
Nausea and vomiting	169	Abdominal pain	10
Pain on flexion of neck or spine (stiffness)	130	Drowsiness	19
Backache or stiffness of waist or extremities	121	Acute pharyngeal tonsillitis	15
Drowsiness	83	Urinary retention	7
Muscle spasm	81	Chills	5
Constitution	77	Delirium	5
Acute convulsions	77	Sweating	5
Positive Kernig's sign	69	Phenomena	1
		Convulsions	1

TABLE II  
Diseases Admitted with Incorrect Diagnosis of Poliomyelitis  
(52 Cases)  
Minneapolis General Hospital 1937 to 1942 inclusive

No. Cases	No. Cases
Acute upper respiratory infections	11
Meningitis	8
Guillain-Barre syndrome	5
Pneumonia	4
Encephalitis	3
Rheumatic fever	3
Chorea (paralytic type)	2
Brain tumor	2
Lymphocytic choriomeningitis	2
Appendicitis	1
Cardiac disease	1
Malaria	2
Equine encephalitis	1
myleitis	1
Transverse myelitis	1
Hysteria	1
Typhoid fever	1
Scarlet fever	1
Measles	1

# AMERICAN STUDENT HEALTH ASSOCIATION MONTHLY NEWS-LETTER

(The Council of the American Student Health Association met at the Palmer House in Chicago, March 6 and 7, 1943. At this meeting the Editorial Committee was asked to provide a monthly digest of medical and Association news for distribution to the member institutions either by mail or through the columns of the *JOURNAL-LANCET*. This month's digest has been prepared by Dr. Dean F. Smiley, Cornell University, now Lieutenant Commander in the U. S. Navy. Other action that was taken in two morning sessions and afternoon session is recorded below Dr. Lyght's editorial.)

## STUDENT HEALTH AND THE WAR

Charles E. Lyght, M.D.

Director, Health Education, National Tuberculosis Association

If sometime a graph is drawn to show the growth of student health services in American colleges and universities, the line will not trace an uninterrupted ascent from zero to saturation. Several rests and an occasional stumble will mark its climb to the peak.

Historians of the student health movement have recorded how slowly the idea caught on among educators that institutions of higher learning owe it to their students to provide facilities for health instruction and health protection as well as a reasonable degree of campus medical care. After college presidents and boards had accepted the challenge and had begun to set up admirable departments, there ensued a period of coolness on the part of the medical profession toward the new project. Student health physicians have witnessed the gradual dissipation of suspicion and unfriendliness as they demonstrated to their medical colleagues that they were not in competition with traditional forms of practice. They proved that their activities closed this hiatus in health coverage and that they were educating large numbers of prospective American leaders to the advantages of prompt and adequate medical care.

Following World War I there was a gratifying and prompt increase in the number and quality of college health services, while in the years of the great depression the advance faltered as budgets grew slender and administrators cautious. Latterly there has been another spurt of development, mirrored by a sharp upswing in membership of the American Student Health Association. The recent appointment by the American Medical Association of a Committee on Student Health stresses the importance of the movement and the warm acceptance it is now privileged to enjoy.

At the moment we come to what may appear eventually as another plateau on our graph. The heavy impact of the global war upon colleges and universities is too well realized to need elaboration. Certainly the colleges cannot escape their share of the dislocation of normal plans and functions that war brings to all men and all systems. Nor would they wish to assume less than their allotment of obligations, even tribulations, in winning the war.

However it is well known that physical fitness and mental health are prerequisites to maintaining a war-winning army, navy or civilian front. It is also known that the government has seen fit, in many cases, to choose colleges and universities possessed of modern stu-

dent health facilities, when establishing training centers for young men and women preparing for special branches of service. Only the healthy can meet government standards, and too many of those rejected because of health defects have been found to be the victims of health neglect. Colleges must lead in avoiding these mistakes in the future.

Accordingly, with their staffs shrunken by the demand for doctors and nurses elsewhere, and faced by the uncertainties of material supply and budgetary adequacy, the nation's student health services are needed as never before—needed to keep a wary eye on the effects of vastly accelerated programs of study and of sometimes overly enthusiastic "toughening" processes; needed to prevent campus epidemics, to weed out tuberculosis from the apparently healthy and to carry out a well rounded plan of immunization against other communicable diseases. Although hope for expansion seems futile, thought of retrenchment must not be entertained. A plateau, perhaps, but no downhill course is permissible.

If the student health physician can help his government, his institution and his uniformed or civilian charges to weather this storm, he will have contributed significantly toward winning the war, and, in the peace that we work and wait for, he will see his efforts and his record rewarded by a tremendous increase in the vitality and scope of the college health movement, until none can be found oblivious to the importance of student health.

The following institutions were voted into membership in the Association which now numbers 195 institutions:

Queens College, Flushing, Long Island, New York,  
Montana State Teachers College, Bozeman, Montana,  
University of Dayton, Dayton, Ohio,  
Southwest Missouri State Teachers College, Springfield, Missouri,

Emory University, Emory University, Georgia,  
Earlham College, Richmond, Indiana,

The following changes were made in the Standing Committees:

Dr. E. Lee Shrader replacing Dr. D. F. Smiley, now in the Navy, as Chairman of the Committee on Local Sections.

Dr. C. E. Turner replacing Dr. A. G. Gould, now in the Army, as Chairman of the Committee on Health Instruction.

Dr. M. L. Durfee replacing Dr. W. B. Brown as Chairman of the Committee on Administration.

Dr. E. Lee Shrader, returning to the Chairmanship of the Committee on Research, replacing Dr. Llewellyn R. Cole (acting Chairman).

Dr. C. C. Fry replacing Dr. Helen P. Langner on the Committee on Mental Hygiene.

Dr. R. W. Bradshaw was appointed to draw up a resolution on the death of Dr. Lee H. Ferguson. Dr. Dan G. Stine was appointed to draw up a resolution on the death of Dr. W. B. Brown. Both Dr. Ferguson and Dr. Brown have been active members and have made important contributions to the work of the Association.

After a canvass of the experiences of the institutions represented at the meeting it was the consensus of opinion that in contracting with the military authorities for medical care of military trainees a provisional figure of \$3.50 per student per month was a reasonable one. Where less than complete medical services are provided, deductions would, of course, be made from that figure. It is assumed that all such contracts are tentative ones and that adjustments calling for a return to the government of any profit on the contract, or of refunding to the college for any loss on the contract will be made each quarter.

It was voted to send a letter to the Surgeon General of the Navy inviting attention to our already existing health services and urging their utilization for the care of Navy trainees. The necessity for providing naval personnel to maintain the rather intricate Health Records of the Navy was pointed out.

The Committee on Tuberculosis through its Chairman, Dr. H. D. Lees, reported that among approximately 500,000 students included in the Association's tuberculosis program in 1942, active pulmonary tuberculosis of the adult type was found in approximately 0.2 per cent.

It was voted to leave the question of a 1943 meeting of the Association open for the time being.

Since there was no 1942 meeting, it was voted to hold over such papers and committee reports as had been submitted for publication in the 1943, or 1944 Proceedings and omit publication of any proceedings for 1942.

It was voted to continue membership dues as usual utilizing the funds usually devoted to the proceedings for providing other services to the member institutions.

**Personnel Changes:** Dr. Ann Tompkins Gibson has been named resident physician at Wilson College, Chambersburg, Pennsylvania, replacing Dr. Agnes Lyon Brown who has entered the United States Public Health Service.

Dr. M. W. Husband has returned to direct the Student Health Service at Kansas State College, Manhattan, Kansas, relieving Dr. J. W. Hanson who has accepted directorship of the Health Service at Carleton College, Northfield, Minnesota. Dr. C. E. Lyght, former director at Carleton College, is now Educational Director for the National Tuberculosis Association.

Dr. Kenneth Christopher has replaced Dr. Nathan Gerrick at Boston University.

Dr. Herbert Ratner replaces Dr. Earl E. Kleinschmidt (Head of the Public Health Department of the Loyola

Medical School) as a full time director of Loyola University Health Service. This is the first time in the history of this school that a full time director has been employed.

Dr. Daniel L. Borden, formerly of George Washington University at Washington, D. C., is now a Colonel in the Army Medical Corps and is located at Fort Eustis, Virginia.

Dr. Charles E. Shepard of Stanford University is now in the United States Public Health Service and is stationed in California.

Dr. Dean F. Smiley, in the Navy, is located in Washington, D. C., and Dr. A. G. Gould is in the Army, located at Camp Breckinridge, Kentucky. Dr. Jennette Evans is the acting head of the Health Service at Cornell University.

Dr. William L. Holt is located at Massachusetts State College at Amherst, Massachusetts, while Dr. E. J. Radcliffe is with the Armed Forces.

#### A.S.H.A. DIGEST OF MEDICAL NEWS

**Aid in controlling noise.** The January, 1943, *Scientific American* reports the development of a plaster ear stopper. A physician or qualified technician makes an impression of the external auditory canal with a special plaster material. The mold is sent to the company for the preparation of the device in plastic. With the device in the ears there is said to be a diminution in sound intensity of 10,000 times and a reduction of 40 decibels in sound.

**Yellow fever prevented in British troops.** Only three cases of yellow fever have been reported among British troops since the beginning of the war. Inoculation of all troops going to endemic areas was required before the war and has been consistently maintained, according to the British Secretary of the State for War.

**Epidemic kerato-conjunctivitis.** The Subcommittee on Ophthalmology of the National Research Council reports this disease occurring in certain larger industries of the west coast, the east coast and recently, New York State and the middle west. There is an average of 18 days loss of work per case and corneal infiltrates occur in 90 per cent of the cases. The conjunctivitis tends to clear spontaneously in less than two weeks, but the corneal infiltrates tend to persist for weeks or months. Infected individuals should be isolated immediately and the spread of the virus by the physicians' hands scrupulously avoided.

**Hypertonic saline in burns.** Tosenthal of the National Institute of Health finds that hypertonic saline by mouth or parentally, if administered promptly after severe burns has remarkable value in preventing fatal burn-shock in mice. He has not yet applied the principle to humans.

**Suitable antiseptic for first-aid use.** The Committee on Surgery of the National Research Council recommends a 1-1000 solution in water or 15 per cent alcohol of proflavine monohydro chloride dispensed in a brown bottle to prevent deterioration by light. It is not patented.

(Continued on ninth page following)

## Book Reviews

**Advances in Pediatrics, Volume I,** edited by ADOLPH G. DE SANCTIS, M.D.; 306 pages. New York, New York: Interscience Publishers, Inc., 1942, price \$4.50.

This book reveals the recent progress in the field of pediatrics by means of a collection of papers written by a group of pediatricians. Some of the authors have presented articles which include their own research studies, others have written reviews as volunteers. All papers are well planned and fairly complete, but all the writers are not authorities or leaders in the fields of pediatrics. The book is of definite value to the general practitioner as well as to the practicing pediatrician. However, it is important that the editor make every effort to keep the future volumes up to the standard of the first one. This is a difficult task and if not well performed will lead to a lack of interest in this type of publication.

**Abdominal Surgery of Infancy and Childhood,** by W.M. E. LADD, M.D., and ROBERT E. GROSS, M.D. Philadelphia: W. B. Saunders, 455 pages, 614 illustrations and 268 figures, 1941, price \$10.

For the first time in the history of American surgery such a work is presented and it was long overdue. It could have been produced only with the magnanimous gift of the Godfrey M. Hyams Trust Fund. It is exceedingly well written, the illustrations and charts excellently executed. Outstanding features are chapters on Congenital Hypertrophic Pyloric Stenosis, with particularly well handled matter on pre-operative care and well described and illustrated operative procedures, and on Congenital Atresia and Stenosis of the Intestine.

The following sections contain original and helpful material: Appendicitis, Diseases of the Spleen, Umbilical Hernia, Inguinal Hernia, Undescended Testicle, Embryoma of the Kidney. The references at the end of each chapter are timely and helpful to those inclined toward more extensive reading on the subjects. The book deserves a place on the active bookshelf of doctors who operate on infants and children and will save some lives that might otherwise be lost.

**The Prevention of Deformity in Childhood, A Primer** by RICHARD BEVERLY RANNEY, N.A., M.D., and ALFRED RIVES SHANDS, JR., B.A., M.D. Elyria, Ohio: National Society for Crippled Children, Inc., 188 pages, 1941, price \$1.00.

With increasing interest being shown by the medical profession in deformities of children, the small monograph is most helpful in aiding the physician to obtain orientation as to whether certain diseases will cause deformities and if so, just what the doctor should do to prevent them or reduce their severity. Neglect has led to deformity. Often the physician does not know that a disease can cause a certain deformity. This book is comprehensive enough to instruct him as far as possible in the prevention of deformity for practically every condition he might encounter in his practice.

**Handbook of Treatment,** by E. A. MULLEN, M.D. Philadelphia: F. A. Davis Co., 707 pages, 1942, price \$4.50.

This volume has again been revised and reprinted as of January, 1942. There will always be demand for a book of this kind and especially at the present time. The advent of sulfanilamide and its derivatives has driven physicians to the use of reference works giving tables of dosage and methods of use. Vitamins with their perplexing combinations require a daily peek at the latest information. We would be inclined to criticize the many examples of polypharmacy in the formulary but without polypharmacy, there would be no need of a formulary and these impressive prescriptions will delight the souls of many.

**Carcinoma and Other Malignant Lesions of the Stomach;** by WALTMAN WALTERS, HOWARD K. CORAY, JAMES T. PRIESTLEY and associates of the Mayo Clinic and Mayo Foundation, notably ALVAREZ, EUSTERMAN, KIRKLIN, MACCARTY and SNELL. Philadelphia: W. B. Saunders, 576 pages, 1942, price \$10.

By assembling the total experience of the Staff of the Mayo Clinic over a period of thirty-one years, the authors have made available to the medical profession a body of information concerning cancer of the stomach, which, if carefully used and judiciously acted upon, should lead to early, accurate diagnosis and courageous treatment of a disease which, through neglect and pessimism still exacts too large a toll of human life. Eleven thousands cases of malignant disease of the stomach, (99 per cent cancer), with 6,352 operations is a mass of material from which valuable help should certainly be derived. And in characteristic manner, statistical data constitutes an important part of the book.

Following chapters on methods of diagnosis and on pathology summarizing the well known opinions of MacCarty and Broders, the middle one-third of the book is taken up with surgical procedure and technic. A good deal of extraneous matter has been included in this part, much of it not germane to the subject, but no doubt of some interest.

The chapter on roentgen treatment is, by the nature of the disease in question, general and inconclusive. The concluding sections on progressive and end results should be of actuarial value.

The index is elaborate and historical references to well known sources are given.

## Future Meetings

May 24-27, at Rochester, New York: four-day War Conference of the American Association of Industrial Physicians. Dr. Wm. A. Sawyer, Medical Director of Eastman Kodak Company, is general chairman.

May 28, at Omaha, Nebraska: The department of Obstetrics and Gynecology of the University of Nebraska College of Medicine presents a symposium on obstetrical analgesia and anesthesia with guest speakers F. S. Hartman, M.D., Detroit, Michigan, R. A. Hingson, M.D., Staten Island, New York, N. R. Kretschmar, Ann Arbor, Michigan, A. H. Parmalee, M.D., Chicago, Illinois. Advance registrations should be sent to Dr. Willis E. Brown, University Hospital, Omaha, Nebraska.

July 6-7, at Billings: annual convention of the Montana State Oto-Ophthalmological Academy. Dr. W. R. Morrison of Billings, president.

July 7-8, at Billings: State Medical Association sixtieth annual meeting, Session of House of Delegates, Scientific Session, Meeting of the Council, Meeting of Women's Auxiliary.

August 16-26, at the Michael Reese Hospital, Chicago: cardiovascular department, a graduate course in Electrocardiography for physicians; Dr. Louis N. Katz, conducting.

October 12-14, at New York: American Public Health Association three-day Wartime Public Health Conference and 72nd annual business meeting of the Association.

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MINNEAPOLIS, MINNESOTA, MAY, 1943

## CHILD HEALTH AND NATIONAL STRENGTH

A perusal of the articles contributed to this special Pediatrics number of the JOURNAL-LANCET strengthens our conviction that more attention should be given to the problems of child health during the war, as well as in peacetime. The exigencies of national defense quite naturally demand first consideration for those among us who are engaged in or are soon to be engaged in military service. However, when our needs beyond the immediate present are considered, we are forced to admit that the emphasis in the medical field must be changed in the future from the reparative to the preventive point of view. The appalling incidence of necessary rejection of men from the armed services because of physical and mental disabilities is a sober challenge to American citizens and particularly to the medical profession.

The special emphasis accorded the subject of child health by Prime Minister Winston Churchill in his most

recent radio message to the British people indicates that our friends on the other side of the Atlantic have encountered problems similar to our own in the matter of health deficiencies in their young adult population. Rather tardily, the British, like ourselves, have come to recognize the paramount importance of making improvement in child health a major feature of any future program to be set up for furtherance of national security and social betterment.

The free peoples of the western democracies have long tacitly recognized that "the child is father of the man" and have made sporadic efforts to make him a worthy "father". However, in proportion to its real importance we have been niggardly in our attention to the most serious responsibility that individuals and states fall heir to upon their arrival at maturity, namely, that of producing a new generation of men superior to the one preceding it. Our present enemies, the totalitarian axis countries, in preparation for forced expansion, organized child health and training programs on a grand scale. !

cause they recognized the close relationship between good health and national strength. That foresight on their part makes them far more formidable enemies today than they would otherwise have been.

Our own *laissez faire* attitude toward child health and training during the same period places us at a disadvantage. It is true that we have had the benefit of such private youth organizations as the Boy Scouts and Girl Scouts of America and other groups sponsored by individual schools and churches primarily for the purpose of "character building," but the nation's halting program for improving child health has obviously been inadequate. Even our own enlightened profession is still overwhelmingly "cure-minded" or "therapy-minded" instead of being predominantly "prophylaxis-minded".

Those members of the medical profession who participated in the comprehensive, non-governmental program of Mr. Hoover's White House Conference on Child Health and Development in 1929-1930 can recall with what thoroughness and enthusiasm the first phase of the undertaking was carried out. The fact that such a brilliantly conceived and carefully planned program was allowed to succumb merely because it lacked the financial support needed for carrying out its wise recommendations, stands as a testimony to our shortsightedness. It is interesting to speculate on the possible advantages that we might be enjoying today, had wise governmental or private agencies provided adequate support for its full operation over the years which have intervened. Since the data collected and the recommendations made by the White House Conference are as sound today as when they were first brought forth, they should form the basis of a new program to be placed in operation at the earliest possible date.

I. McQ.

### PEDIATRICS IN NEW ORLEANS

New Orleans has a group of well-trained and capable pediatricians engaged in private practice. In addition to providing their private patients with services of superior quality they also conduct many well-baby clinics which are supported by the New Orleans Bureau of Child Welfare. In these clinics they supervise the feeding of several thousand infants and children each year, and administer the Bureau's immunization program, including Schick and tuberculin testing, small pox vaccination, and immunization against pertussis, diphtheria, tetanus and typhoid fever. The total of 708 immunizations and tests performed during February, 1942, provides a fair estimate of the volume of the work being done by the pediatricians working in these free clinics.

With respect to the type of disease seen most commonly in children, conditions in New Orleans closely resemble those in Minneapolis. Seasonal waves of chicken pox, measles, pertussis and scarlet fever occur, and during the winter months upper respiratory infections and pneumonia are common in children. In the warm months of the year the incidence of diarrhea increases, but its prevalence here is far less than I expected.

In some respects diseases seen in children in the South differ from those seen in the North. Physicians deal daily with a variety of intestinal parasites, and summer-

time brings its crop of furuncles. Rheumatic fever is common in New Orleans and when it occurs in a colored child the difficulty that may attend its diagnosis is increased if sickleemia is present. In the land where oranges grow, florid scurvy is occasionally encountered, and our experience with congenital syphilis is particularly rich. But strange to say, malaria in children is a curiosity in New Orleans.

C. A. S.

### ACUTE SINUSITIS IN CHILDHOOD

Aggressive treatment of acute sinusitis was once a popular procedure. That is no longer so. The trend is definitely in the reverse direction.

No one knows better than the conscientious physician how necessary it is for him to be alert to the changes in medical thought and practice that occur from time to time. He may ridicule some archaic form of treatment in the distant past, but he cannot be oblivious to the fact that any transition from the old to the new has come about gradually. Progress has been made through a recognition of failure as well as success. Truths as we accept them today have come down slowly through a long grind of research and toil. Careful observation, painstaking examinations, discussions and consultations have contributed to point the way. There may not be complete agreement, but the trend against active surgical intervention in cases of acute sinusitis has nearly completed its cycle. Its status may be compared to the present well established dictum of nonintervention in cases of acute salpingitis.

We are pleased to find that pediatricians, aware as they naturally are of the minute size of their little patients' sinuses, appear to be in full accord with the modern teaching of more gentle and persuasive methods, based on mild astringents to reduce turgescence at the sinus opening, and steam.

A.E.H.

### OFFICIAL CALL

The House of Delegates of the South Dakota State Medical Association will meet to transact the business of the Association on Friday, May 28, at the Marvin Huggett Hotel in Huron. The first session of the House of Delegates will convene at 9:30 A. M., the second session at 1:30 P. M.

The Council will meet at 8:00 P. M. on Thursday, May 27, for its first session. The second session will be immediately following the second session of the House of Delegates, at which time the newly elected Councilors will be seated, and the chairman elected for the ensuing year.

The secretary-treasurer's term of office expires at this time, and the matter of electing a secretary-treasurer for a three year term will be taken up by the Council at the second meeting. The following Councilors' terms expire this year: the 9th District, 10th District, 11th District, and the 12th District. Councilors are elected by the House of Delegates for a three-year term. Will those districts whose Councilor terms expire please take note and instruct your delegate as to your desire for candidate.

CLARENCE E. SHERWOOD, M.D.,

Secretary.

April 28, 1943

# 7 ways TO GIVE INFANTS AND CHILDREN THEIR DAILY VITAMIN REQUIREMENTS



**FOR INFANTS:**



**1. FORMULA.** One of the easiest ways to give vitamins is to add Vi-Penta Drops to the baby's formula or milk.



**FOR CHILDREN:**

**3. MILK.** The flavor of even such a bland food as milk is not affected by the addition of Vi-Penta Drops.



**FOR CHILDREN cont'd.:**



**5. VEGETABLES** served with the noon or evening meal, can be enriched with Vi-Penta Drops, too.



**6. FRUITS.** Vi-Penta Drops seem to have a natural affinity for stewed fruits—apricots, apples, prunes, etc.



**7. DESSERTS.** Many mothers enrich desserts and puddings with Vi-Penta Drops.

**4. CEREALS** are good bases to which to add the child's needed additional vitamins at breakfast time.

... using easy-to-use **Vi-Penta Drops**  
that do not affect the flavor of food

Here is a remarkable liquid multivitamin preparation which makes it possible for the physician to prescribe a liberal vitamin regime that the mother can easily carry out. Not only do Vi-Penta Drops contain 5 principal vitamins (see chart), but these drops also possess the remarkable advantage of mixing readily with various foods, *without affecting the taste*. When you prescribe Vi-Penta Drops, suggest their use in the several ways pictured here. Mothers will appreciate the information.

30 minims of }  
Vi-Penta Drops } 4000 U.S.P. 333 U.S.P. 100 grams 300 U.S.P. 400 U.S.P.  
contain: } units units riboflavin units units

*Vi-Penta Perles*—tiny gelatin globules, each containing the same amount of the vitamins as 10 minims of the Drops. Supplied in packages of 25, 100, and 250.

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## News Items

The American College of Surgeons, holding in abeyance plans for a Clinical Congress this year, offered the last of twenty regional war sessions for physicians and surgeons of Montana, Washington, Oregon, and British Columbia on April 20 at Seattle.

The South Dakota state board of health has conducted clinics for immunization against typhoid fever in Ft. Pierre and Herried following the recent flood period. The municipal water supply systems in all areas affected have been under constant surveillance by members of the Division of Public Health Engineering preceding, during and after the floods.

Dr. Melvin W. Binger of the Mayo Clinic, Rochester, Minnesota was guest speaker at a recent meeting of the Winona County Medical Society. His subject was "Nephritis and Edema."

Capt. Jas. D. Morrison, M. C., was granted a furlough from Fort Geo. G. Meade, Maryland, to attend and present a paper at the Butte, Montana, meeting of eye, ear, nose and throat specialists. Dr. Morrison practised in Billings.

Dr. F. K. Waniata, Great Falls, Montana, has become associated with Drs. Irwin, MacGregor, Lord and Little where he will assist in clinical activities and continue his private practise.

Dr. Jno. S. Kilbride, who left Canby, Minnesota, in 1936 after 30 years of practise to join his son, Dr. Edwin A. Kilbride in Worthington, has reopened his office in Canby.

Dr. Dolson W. Palmer, former physician at the Fort Totten Indian Agency, North Dakota, and more recently with the veterans administration near Oakland, California, has removed to Cando, North Dakota, to take over the practise of the late Dr. Kristinn Olafson.

Dr. H. H. Parsons, a retired major in the United States Medical Corps who recently resumed private practise in Sidney, Montana, his earlier home, has accepted an appointment as surgeon in the government hospital at Oklahoma City, Oklahoma.

Dr. T. J. Bloedel, practising in Gaylord, Minnesota, for the past year, closed his office there on April first to become associated with Dr. Arthur Neumaier at Glencoe.

Drs. Daniel W. Wheeler, Peter S. Rudie, Mark Tibbets and Lawrence R. Gowan, all of Duluth, Minnesota, and all of whom were lieutenant commanders in the Minnesota naval reserve, after twenty months on the staff of the Navy hospital at Bremerton, Washington, have been promoted to the rank of commander.

Capt. Thos. E. Corcoran, M. C., of Rock Rapids, Minnesota, has been reported missing in action in North Africa.

Dr. Fred W. Rankin, once head of a Mayo Clinic section in surgery, has been elevated to the rank of a brigadier general in the army medical corps which was the tank held by his father-in-law, the late Chas. H. Mayo, and Dr. Mayo's brother, the late Dr. William J. Mayo, in their service in the World war.

Dr. Emmett R. Samson of Stillwater, Minnesota, has been commissioned a lieutenant commander in the medical corps of the Navy and has entered the service at San Diego, California.

Dr. James R. Kingston of Coleraine, Minnesota, one-time practitioner at Deer River and later a member of the State Health Board, now in active service in control of a Southern Pacific malaria unit, has been promoted to lieutenant commander.

Dr. Milo H. Larson of Nicollet, Minnesota, has been ordered to the Army Air Corps at Carlisle Barracks, Pennsylvania.

Dr. Gaylord W. Anderson, head of the division of preventive medicine and public health, serving in a public health capacity in the office of the surgeon general of the army, has been made head of the army's division of medical intelligence, the so-called "health spies" who compile health, climatic and sanitation evidence with respect to all areas to which United States troops may be sent.

Dr. Edward A. Hackie of Hallock, Minnesota, a Canadian by birth, as the culmination of two years of effort has found it possible to enlist in the United States army and will assume military duties as a lieutenant at Camp Grant, Illinois.

Major Michael L. Mitchell is the new post surgeon and director of the medical division at Fort William Henry Harrison, Helena, Montana, succeeding Major Lester Besecker who became surgeon of the First special service.

Lieutenant Wm. M. Thebaut, for eight months medical officer at the main Montana navy recruiting station in Helena has been transferred to the naval hospital at Bremerton, Washington, the replacing officer being Lieutenant Walter Mauther who has been serving as post surgeon at the Bremerton marine barracks. The home of the former is Oakland, California; that of the latter, Milwaukee, Wisconsin.

Dr. Chas. J. Bresee, Great Falls, Montana physician, named to succeed the late Dr. Enoch M. Porter, Great Falls, on the state board of health.

Dr. Lester McLean, former Bismarck, North Dakota resident and at present city and county health officer at Vallejo, California, now heads a staff of twelve doctors, nurses and inspectors as chief of the new Vallejo health center dedicated in March.

Dr. Ralph Rossen, superintendent of the Hastings, Minnesota, State Hospital for the past five years, will leave for Bethesda, Maryland, for active duty as a post assistant surgeon Lieutenant Senior grade in the Navy. He has been given a military leave of absence.

THEY DESERVE THE SMOKE  
THEY LIKE THE BEST\*



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\*With men in the Army, Navy, Marine Corps, and Coast Guard, the favorite cigarette is Camel. (Based on actual sales records in Post Exchanges and Canteens.)

Remember, you can still send Camels to Army personnel in the United States, and to men in the Navy, Marines, or Coast Guard wherever they are. The Post Office rule against mailing packages applies only to those sent to men in the overseas Army.

**CAMEL COSTLIER TOBACCO'S**

BUT WAR BONDS AND STAMPS

Dr. R. R. Hendrickson, Bismarck, North Dakota, for the past eighteen months superintendent of the sanatorium at Sand Beach near Lake Park, has been commissioned a major in the United States public health service and will be stationed at Juneau, Alaska.

Dr. Byron L. Pampel, formerly of Livingston, Montana, has been re-appointed by the governor to be superintendent of the state hospital at Warm Springs. His administration of the institution is regarded as a progressive one.

Dr. John S. Floyd, Butte, Montana, has been appointed by the board of county commissioners to fill the post of county physician left vacant by the resignation of Dr. Jos. J. Kane.

Dr. Thos. E. Flinn of Redwood Falls, Minnesota, has been appointed county coroner, an elective office for which there were no filings and which was filled temporarily by a Redwood Falls resident non-professional who later resigned.

Dr. George Friedell of Ivanhoe, Minnesota, elected to the presidency of the Lyon-Lincoln Medical Association.

Dr. Frank M. Jolin, Coleraine, Minnesota, re-elected president of the Itasca County Hospital staff.

Dr. Herbt. H. James of the staff of Murray hospital, Butte, Montana, delivered a slide-illustrated lecture on "Cancer and its Control" to the members of the Red Cross home nursing class of Silver Bow County Women's Field Army for Cancer Control.

Dr. Arthur R. Kintner, Missoula, Montana, has addressed several bodies, among them the Rotary Club, on the advance of the sulfonamides in the field of infection treatment.

Dr. L. G. Dunlap, Butte, Montana, discussed progress in medicine and surgery before Rotarians at Anaconda in respect to medication of battle casualties, operations for cataract, blood transfusion and storage of plasma, fracture treatment for broken legs, employment of sulfa drugs for treating infection and the contributions of Dr. Herald Cox who was the JOURNAL-LANCET lecturer at University of Minnesota in 1942. Dr. Cox's work in manufacturing sera with eggs was explained.

South Dakota physicians who attended the New Orleans Graduate Medical Assembly meeting in March: Dr. O. Charles Erickson, Sioux Falls, Drs. Wm. A. Delaney, O. T. Mabee, E. W. Jones and F. J. Tobin, Mitchell.

Dr. F. W. Hennings of Dickinson, North Dakota, and Miss Beth Barnes, formerly of Cannon Falls, Minnesota, and lately of Seattle, were married in Seattle and the couple is living in Pacific Beach, Washington, where Dr. Hennings for the last ten months has been a lieutenant in the naval medical corps.

Dr. Frank Darrow, Fargo, was elected president of North Dakota Medical association at the annual meeting in Bismarck. Dr. F. L. Wicks, Valley City, was elected president-elect. Dr. James Hanna, Fargo, was named first vice president and Dr. A. E. Spear, Dickinson, second vice president. Fargo was named 1944 convention city.

## Necrology

Dr. Campbell Sansing, 70, formerly of Fargo, North Dakota, where he had served on the staff of the Veterans hospital between the period of his practising in Valley City and in Courtenay and his transfer to the government hospital in Muskogee, Oklahoma, died April 4 at his home in Blossom, Texas. He retired last August.

Dr. A. L. Lloyd, 76, of Rapid City, South Dakota, who had been in ill health for three years, died at his home March 27. He had practised in the state since 1898, successively at Leola, Custer, Newell, Belle Fourche, Rapid City and Nisland, returning to Rapid City six years ago.

Dr. Frank A. Moore, 70, pioneer physician and mayor of Yankton, South Dakota, and brother of Dr. D. V. Moore of Sioux City, Iowa, died March 22 after twenty years residence in Yankton, seventeen of which were spent in medical practise and the last three in office. The cause of death was coronary thrombosis.

Dr. Bertha Brainard McElroy, 49, of Jamestown, North Dakota, died at Rochester, Minnesota, March 12. Graduating from the University of North Dakota a Phi Beta Kappa and spending nine years as a high school teacher and principal she resigned to pursue a course in medicine, a lifelong ambition. Dr. Brainard, her marriage to Mr. Jno. E. McElroy having taken place only in 1941, was a graduate of Rush Medical college, city health officer of Jamestown, and a staff member of the student health service of Oregon State College, Corvallis, Oregon, after serving one year's internship at the Women's and Children's hospital in San Francisco and a year at Los Angeles General hospital. She was state president of the American Association of University Women and a member of many civic and professional organizations.

Dr. Francis E. Butler, 62, of Menomonie, Wisconsin, president of the Wisconsin State Medical Society and a practitioner in Menomonie for nearly forty years, died there March 12.

Dr. August Kuhlmann, 67, of Melrose, Minnesota, died April 4th, ending thirty-seven years of practise in that community.

Dr. Henry Porter Johnson, 88, of Fairmont, Minnesota, died March 31 after several invalid months. His career as a family physician dated back sixty-four years, all of which were spent in Minnesota. In addition to an active practise in medicine and surgery Dr. Johnson found time for postgraduate work, hospital management, service on boards of education and church bodies as well as fraternal affiliations and service to business clubs.

Dr. Anton Herman Luedtke, 73, of Fairmont, Minnesota, died March 18 at his home in that city. He was a graduate of the University of Minnesota Medical School and had served in World War I, leaving his practise at the age of nearly fifty years and attaining the rank of Major. His death was due to cancer.

## CONTINUATION STUDY COURSES

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### Obstetrics—May 20-22

Special course for nurses, arranged for Minnesota Department of Health. Other nurses may enroll, but room space will be limited. Practical program of hospital care. Tuition \$5.

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Lectures, clinics, demonstrations, movies, and conferences. Arranged for physicians who will direct care of patients with poliomyelitis. Tuition \$25.

### Obstetrics and Pediatrics—June 7-12

Lectures, clinics, demonstration, movies, and conferences for physicians. Program is arranged for health department representatives from other states. Other physicians may register. Tuition \$25.

### Dermatology and Syphilology—Date to be arranged

Lectures, clinics, demonstrations, and conferences for physicians. Program is arranged for health departments of other states. Other physicians may register. Six-day course. Tuition \$25.

## WOMEN'S AUXILIARIES OF THE SOUTH DAKOTA STATE MEDICAL ASSOCIATION

Huron District No. 5 Medical Auxiliary, pursuant to the custom initiated last year, entertained the doctors March 28 in honor of "Doctors' Day" (March 30), the 101st anniversary of the use of ether as an anesthetic, and of Dr. Oscar Wright, celebrating his fifty years of practise. Held at the home of Dr. and Mrs. R. A. Buchanan, the meeting included as guests Mts. Turner and Mrs. John Hagin, state president, of Miller, and Dr. Howard Saylor Jr. and Miss Mary Ann Peterson of Huron.

Mrs. Hagin, acting for the organization, presented Dr. Wright with a traveling case.

Sioux Falls District No. 7 Medical Auxiliary held its annual meeting and election of officers at the home of Dr. and Mrs. Wm. F. Sercl with the balloting resulting as follows: Mrs. T. J. Billion, president; Mrs. M. O. Lanam, vice president; Mrs. Sercl, secretary; Mrs. J. A. Nelson, treasurer. Twenty-two members attended.

Mrs. A. T. Tolleys spoke on Cancer Control. Mrs. Billion showed colored pictures of the island of Trinidad. Mrs. Otto Hansen, Valley Springs, retiring president, reviewed the work of the year. Mrs. O. C. Erickson presented an afghan to the Army Air Force Technical Communications Corps post at Sioux Falls base. A buffet supper was served. Assisting hostesses were Mrs. Anton Hyden, Mrs. J. A. Nelson and Mrs. Peter VerMuelen.

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## A.S.H.A. DIGEST OF MEDICAL NEWS

(Continued from page 153)

Tetanus antitoxin not used. The *American Journal of Public Health* for January, 1943, reports that in the United States Army tetanus antitoxin is not used prophylactically in wounded cases unless there is reason to doubt that the wounded individual had received at least the initial series of toxoid injections. A prophylactic injection of tetanus toxoid is, however, given.

Treatment of burns reverts again to boric acid ointment. The Subcommittee on Burns of the National Research Council advises discarding tannic acid jelly for the first-aid treatment of burns; first, because the eschar tends to lock in infection; second, because the eschar tends to devitalize surviving islands of epithelium in third degree burns; third, because the eschar precludes the later use of any other method of treatment; fourth, because toxic reactions have occurred where delayed or incomplete tanning permitted absorption of excessive quantities of tannic acid. The use of simple boric acid, or vaseline dressings with a smooth even compression bandage was advised.

Virus of "pneumonitis" or "atypical pneumonia" isolated. Commander T. M. Rivers reports that members of the Naval Research Unit at the Hospital of the Rockefeller Institute for Medical Research have isolated from patients with this disease a virus which is transmissible in the mongoose.

Sulfadiazine chewing gum. The January, 1943, issue of the *Proceedings of the Society for Experimental Biology and Medicine* reports that the chewing of a mixture of 0.325 grams of sulfadiazine in 1.5 grams of paraffine brings about a high concentration of sulfadiazine in the saliva. This may prove of use in acute hemolytic streptococcal infections of the tonsils and pharynx without recourse to large systemic doses.

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## Advertiser's Announcements

### ARMY-NAVY "E" AWARD FOR SQUIBB

A star has been added to the Army-Navy "E" pennants which fly over the New York office and the Brooklyn and New Brunswick, N. J., laboratories of E. R. Squibb & Sons. This is the outward symbol of the renewal for another six months of the "E" award first granted to Squibb in September, 1942.

Approximately one-half of the entire Squibb output now goes to the armed forces or lend-lease, and includes hundreds of products—from dental cream to typhus vaccine. Many departments are working around the clock to insure adequate supplies for both military and civilian needs, for Squibb men and women are determined to keep the "E" pennants flying, and to add a star at regular six-month intervals.

### PARKE-DAVIS RECEIVES HONOR EMBLEM

Detroit, already world-famous as democracy's arsenal of war weapons, achieved prominence in a new field when Parke, Davis & Company received the Army-Navy "E" pennant for excellence in production of materials for saving lives.

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Typhus fever vaccine and scores of pharmaceutical and biological products prepared in Detroit by Parke-Davis men and women accompany the United States fighting forces to front-line combat zones all over the world. Dried blood plasma, prepared from blood of thousands of civilian donors, goes to all parts of the globe from the laboratories at Parke-Davis. These laboratories, among the greatest in this or any other country in facilities for processing blood plasma, went into full-speed production of war material last year.

### HORMONE DOSAGE AT A GLANCE

Schering is currently issuing a series of 6"x9" charts enabling one to tell at a glance the dosage of hormones for various gynecological and endocrine disturbances. The first of these will deal with Dysmenorrhea. At regular intervals, thereafter, charts will be issued on other subjects such as the Male Climacteric and Functional Uterine Bleeding. These charts may well help clarify the maze of seemingly confusing terminology and dosage of endocrine disturbances, and should prove highly useful to practicing physicians.

Physicians may obtain copies of these charts by writing to the Medical Research Division, Schering Corporation, Bloomfield, New Jersey.

### EATING FOOD SHORTAGES

It's well to bear in mind that dried brewers yeast, weight for weight, is the richest food source of the Vitamin B Complex. For example, as little as 1 level teaspoonful (2.5 Gm.) Mead's Brewers Yeast Powder supplies: 45 per cent of the average adult daily thiamine allowance, 8 per cent of the average adult daily riboflavin allowance, 10 per cent of the average adult daily niacin allowance.

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Equine Encephalomyelitis, the virus disease of horses known as blind staggers, has been found also to affect man and reached epidemic proportions in 1941. Lederle Laboratories, leader in producing the veterinary vaccine for treating this disease, has developed a refined vaccine for human use by the egg-embryo culture method. It confers effective immunity to the disease. Although human cases have been reported with the eastern strain of the disease, the western strain is more common and is the one used in preparing the human vaccine.

## SILK SUTURES IN MODERN SURGERY

Reporting on a series of over 2,000 hospital cases, Elkin, in 1939, found that operations in which silk sutures were employed had a percentage of infection of only 2.1, a most significant figure when it is realized that other operations were infected at the rate of 9.4 per cent. According to Elkin, the contributing factors of smaller sizes of silk and more careful operative technic can be disregarded since the two types of sutures used in operations were of a small size. Research reveals that silk sutures enjoy definite advantages. Taylor reports that either the square knot or the triple throw is 100 per cent reliable when using silk. He also reports that knots in silk sutures are much safer than those in other material since the wetting of the silk has no tendency to cause the knots to slip.

There are other advantages, as well. The constant strength of silk sutures, when sutures are buried in the tissue, provides a reliable wound closure. There is no unexpected suture breaking from suture absorption. Because silk may be completely sterilized by boiling or autoclaving, it enjoys a maximum degree of sterility, thus, silk sutures offer safety with strength. Quick healing and consequent shorter hospitalization make silk sutures more economical.

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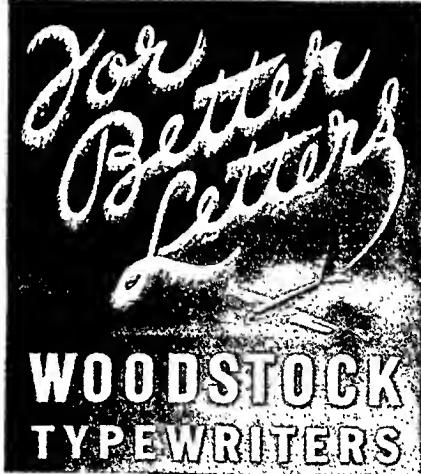
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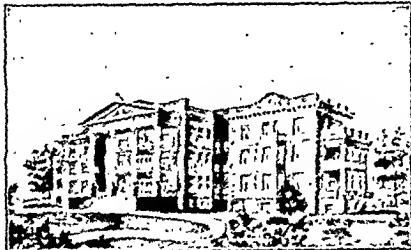
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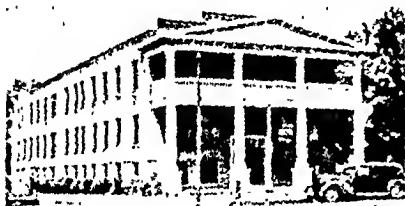
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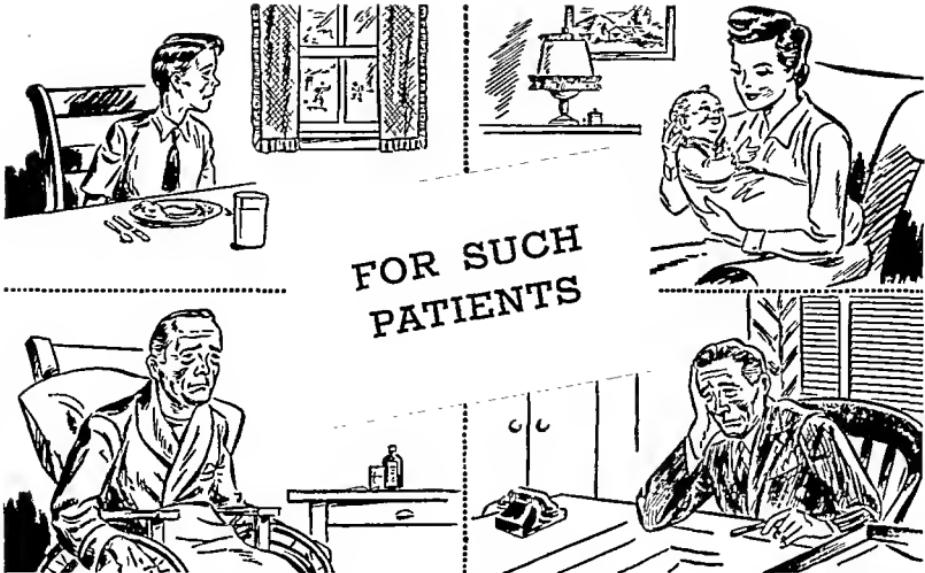
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Minneapolis, Minn.



FOR SUCH  
PATIENTS

## NAVITOL MALT COMPOUND

Provides a Palatable, Convenient—Effective Means of Supplementing the Diet

**Two Tablespoonfuls Navitol Malt Compound Supply** the full minimum daily adult requirements, or more, in vitamins, calcium and assimilable iron, as set by the Food and Drug Administration.

Vitamin A	.	5000 U.S.P. units
Vitamin D	.	800 U.S.P. units
Vitamin C		30 milligrams
Thiamine hydrochloride	..	1 milligram
Riboflavin	..	2 milligrams
Niacinamide*	.	10 milligrams
Calcium (2 gm. tricalcium phosphate)		750 milligrams
Iron (10 gr. iron and ammonium citrates providing 10 mg. average assimilable iron)		106 milligrams

\* Not yet official

### RECOMMENDED DAILY DOSE

For adults — 2 tablespoonfuls  
For children — 1 tablespoonful

PROPER DIET is, at best, a slow means of restoring health to nutritionally under-par patients. For, even if the diet is seemingly adequate, evidences of deficiency may occur as a result of increased metabolism, mal-absorption, mal-utilization, and hastened excretion.

When dietary supplementation is necessary, prescribe Navitol Malt Compound. It's acceptable to patients old or young—is available in 1-lb. and 2-lb. jars.

For literature address Professional Service Department, 745 Fifth Ave., New York

**E.R.SQUIBB & SONS**

Manufacturing Chemists to the Medical Profession since 1858